

CANADIAN ELECTRONICS ENGINEERING

JULY 1961

A Maclean-Hunter publication

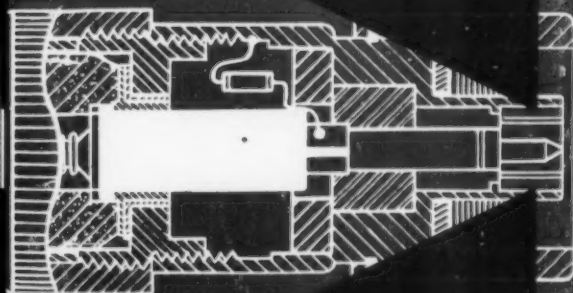
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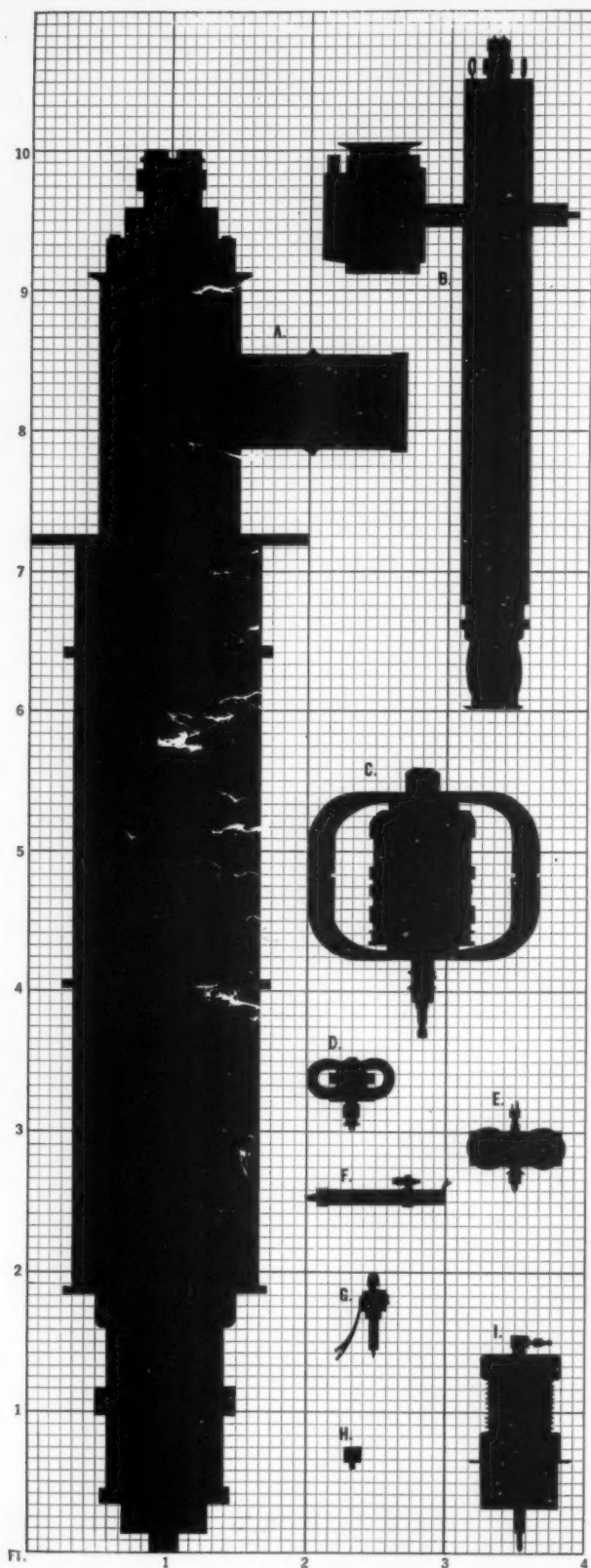
Electronic Industries Association 32nd Annual Meeting

Regulator circuit improves operation of CdS sun-switch

Imports of components and equipment from U.S. and U.K.

Simple crystal holders feature low VSWR, high sensitivity





ONE METER TO FOUR MILLIMETERS

New Litton Electron Tubes for Advanced Applications

A. L-3403 KLYSTRON TUBE: One of our super power line, a long pulse, power amplifier klystron for the Ballistic Missile Early Warning System, delivering 1.25 megawatts peak power output.

B. L-3270 BROADBAND KLYSTRON: A 2 megawatt L-band klystron offering long life, high peak power, 8 percent bandwidth. Other broadband klystrons, using the exclusive Litton Skirtron techniques, are available with higher power in the L through S-band region with .002-.004 duty cycles.

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D. L-3458 HIGH TEMPERATURE PULSE MAGNETRON: Provides long life operation at ambient temperatures in excess of 662°F. Many hours of 900°F operation have been achieved in X-band tests.

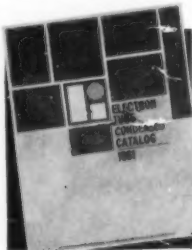
E. L-3629 FLOATING DRIFT TUBE KLYSTRON: High power, water-cooled klystron oscillator fixed tuned at 33,000-37,000 mc. Power output: 15 watts CW minimum. Other tubes available for immediate delivery from 12-4 mm. wavelength.

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G. MICROTRON: The L-3189, one-kilowatt CW magnetron, is accompanied in package form by an electromagnet and filter assembly, high voltage and filament and isolation transformers. Only 6-second warm-up. Two year warranty for domestic microwave cooking.

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 MICROWAVE TUBES AND DISPLAY DEVICES

CANADIAN ELECTRONICS ENGINEERING

Volume five number

7

July 1961

EIA annual meeting focusses attention on problems of electronics industry

The 32nd Annual Meeting of the Electronic Industries Association of Canada, held last month in Ottawa, spotlighted most of the current problems of the industry. Imports, exports, earnings and defence business all received close scrutiny during the three-day event.



John D. Houlding, president of RCA Victor Co. Ltd., Montreal, is the new president of EIA of Canada, succeeding James Key, general manager of Aerovox Canada Ltd., Hamilton. Named first vice-president last year, Mr. Houlding has been chairman of EIA's Electronics Division for the past two years. A former division manager at Canadian Westinghouse Co. Ltd., he joined RCA Victor in 1957, becoming president early in 1960.

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Electronic imports from U. S. and U.K. increased again in 1960

Final figures for the calendar year 1960, just released by the U.S. Department of Commerce, indicate that Canada's imports of electronic components and equipment reached \$92 million, 13½% more than the 1959 total.

Similar data specially prepared for CEE by H.M. Customs & Excise show that imports from the U.K. increased over the same period from \$14.3 million to \$15.9 million, a gain of 11%.

28

Simple holders for crystal detectors feature low VSWR, high sensitivity

Broadband microwave measurements often require low level crystal detectors with high sensitivity and low, uniform VSWR. This paper describes two coaxial holders for cartridge type crystals similar to the 1N23B. The design emphasizes simplicity of construction.

A. Staniforth, left, was born in Aldersyde, Alberta. He received his BSc degree from the University of British Columbia in 1938. The following year he joined the Canadian Broadcasting Corp. as transmitter supervisor in

Vancouver. He left there in 1942 to join the Radio and Electrical Engineering Division of National Research Council, Ottawa.

J. K. Pulfer was born in Gordon, Manitoba and received his BSc in electrical engineering from U. of M. in 1953. After a year of post-graduate work he joined NRC, where he has been working on defence problems. He is a member of IRE.



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Regulator circuit improves operation of CdS sun switch

By regulating the voltage on a cadmium sulphide sun switch, the operating point stays nearly constant despite deterioration of battery voltage. This article describes the regulator circuit used in a sun switch designed to control navigational aid lights.



S. A. Gardiner was born in Ottawa in 1918 and received his education there. He joined NRC in 1938 and worked on radar development during World War II. Since then he has been associated with the Navigational Aids Section working on problems such as remote fog alarm controls and automatic lighthouse equipment. Recently he has been assisting the Canadian Wildlife Service in applying electronics to some biological problems.

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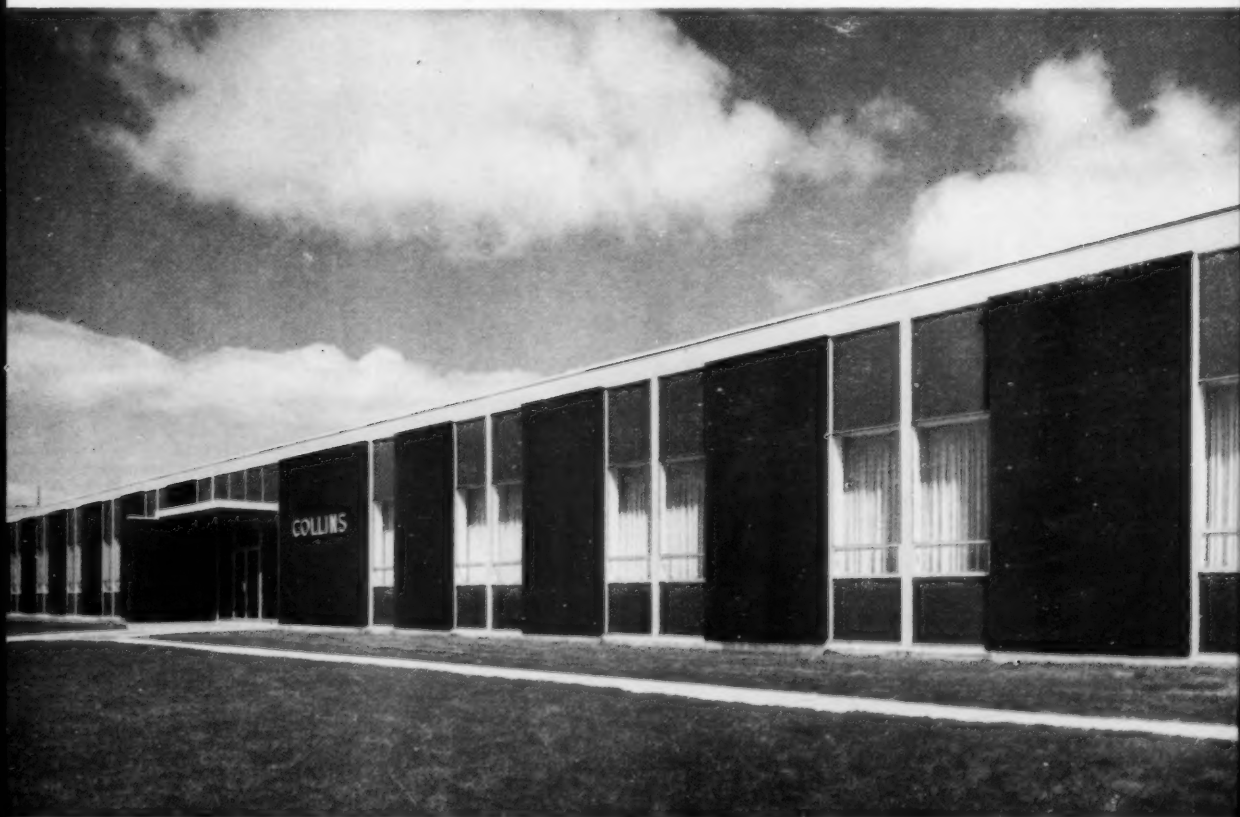
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COLLINS CANADA EXPANDS

Collins Canada marks another advance in its growth with the opening of its new manufacturing plant in Toronto. With this new plant Collins has doubled its production, design and research facilities.

■ In seven years, Collins Radio Company of Canada Ltd., has grown from a small manufacturing operation into a major supplier to the communications industry... a supplier of Canadian-built aviation, ground and marine communication and electronic equipment for the domestic and International markets.

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Collins Radio Co. of Canada continues expansion with opening of new plant

Since it began operations in Canada seven years ago, Collins Radio Co. of Canada has expanded from a single sales office to a full manufacturing company. Original design work on military and commercial equipment is now done in Canada. A new plant has increased facilities.



36

Patent news

This invention describes a magnetic core memory with parallel read-in and read-out. Its advantages over previous magnetic memories are that it is easier to build and

maintain, while it eliminates the induction of spurious read-out signals. It was invented by Dr. R. S. C. Cobbold while working at DRTE, Ottawa.

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NEWS HIGHLIGHTS

Federal budget provides tax incentives for industrial and scientific research

The 5% limit on the amount of corporate income that can be deducted under current expenditures for industrial and scientific research has been lifted. This limit, however, has in the past been reached by only a few firms. Payments to scientific research foundations can also be claimed as deductible. In addition, the present provision for full write-off for tax purposes of capital expenditures on research over a three-year period has been relaxed so that the full write-off can be claimed in a single year.

Television pioneer proposes formation of government-sponsored fourth network in U. S. to serve cultural minorities.

Dr. Allen B. Du Mont, television pioneer and founder of Allen B. Du Mont Laboratories, has stated that a fourth television network supported by the United States government is urgently needed to solve the programming ills and excesses prevalent in commercial networks and individual stations. He made the statement during an address accepting honorary membership in the American Institute of Electrical Engineers, the highest honor given by the society.

Dr. Du Mont said: "We are spending over 40 billion dollars for defense, space projects, and maintenance of our arms establishment. I plead for a few million and some men with guts to bring culture and information to the television screen. Let's give the commercial networks a real run for their money with top-notch programming on a new government-supported network designed to satisfy the true needs

of our children and the cultural and intellectual requirements of the country's more discriminating minorities.

Re-evaluation of goals of undergraduate electrical engineering education urged by Cornell professor in AIEE paper.

The re-evaluation was recommended by Simpson Linke, associate professor of electrical engineering at Cornell in his Summer General Meeting paper "Educating electrical engineers for professional careers." Said Prof. Linke: "The present emphasis on science and mathematics in electrical engineering curricula is creating a research-oriented type of undergraduate education that may lead to inadequate preparation for professional careers in engineering. Since 80 to 90 percent of our undergraduates intend to follow professional, rather than research or teaching careers, re-evaluation of the goals of electrical engineering undergraduate education is required."

Canadian power utilities ask DOT for more radio frequency allocations

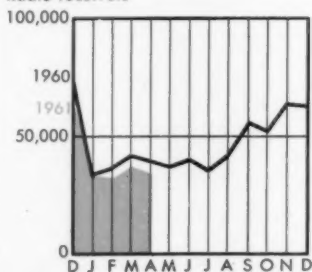
The Canadian Electrical Association has presented a brief to the Minister of Transport expressing its increasing concern over the current spectrum status of the electric power industry. It requested that provision be made in over-all frequency allocation policy to permit the industry to meet its responsibility to the public. Specific suggestions were made in regard to power line carrier, point-to-point radio and mobile radio communications.

Record player sales continue to recover

Note: The reports for April 1961 and year-to-date 1961 on which these charts are based do not include the April figures for Canadian Admiral Corp. Ltd.,

which has terminated its membership in EIA's Receiver Division. The April 1960 and year-to-date 1960 figures do include the former member company's sales.

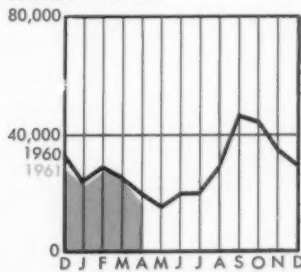
Radio receivers



Year to date
1960 151,722
1961 136,079

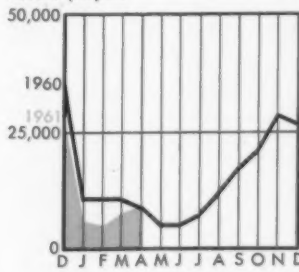
Distributor sales to dealers, in units

Television receivers



1960 100,578
1961 93,846

Record players



1960 41,633
1961 31,306

Source: EIA of Canada / Charts: CEE

SPAT*

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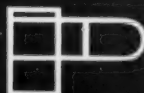
*Trademark Philco Corp. for Silicon Precision Alloy Transistor

TYPE NO.	MAX. RATINGS		CHARACTERISTICS		
	V _{CEO}	P _{DISS}	I _{CEO} (10v) MAX.	h _{FE} (6v, 1ma) MIN. MAX.	f _T (6v, 1ma) MIN.
2N858	40v	150 mw	0.1 μa	15 75	5 mc
2N859	40v	150	0.1	30 120	6
2N860	25v	150	0.1	15 45	6.5
2N861	25v	150	0.1	30 100	7.5
2N862	15v	150	0.1	20 60	8
2N863	15v	150	0.1	40 120	10
2N864	6v	150	0.1 (8v)	25 125	16
2N865	10v	150	0.1	100 350	24

Completely new to the industry, these Philco Silicon Precision Alloy Transistors meet a widespread need for medium frequency, high voltage, high beta silicon transistors for both switching and amplifying applications. An exclusive new production technique... strip alloying... permits accurate measurement of the diode voltage rating and beta of every transistor during the manufacturing process. Never before has such close control in production been possible.

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Appointments show trend to use technical people in management

Ernest Wall has been appointed manager of planning and development at Aviation Electric Ltd., Montreal.

Mr. Wall obtained his BASc (electrical engineering) and MASc (specializing in servo-mechanisms) from the University of Toronto. After serving as a radar officer in the Canadian Army, he returned to the university as a lecturer in electrical engineering for a period of four years. His business career includes three years in Toronto where he worked on several airborne navigational systems, then senior systems engineer with an electronics firm in Boston. Mr. Wall then joined de Havilland Aircraft of Canada Ltd. and worked on air-to-air missile design and development in England. In 1955 he returned to Canada to direct the engineering activities of de Havilland's Guided Missile Division. In 1960 he became technical manager for the Special Products Division, responsible for market research and sales.



Wall



Binions

W. L. Murray Binions has been appointed sales manager of Collins Radio Co. of Canada Ltd.

Previously Mr. Binions was commercial sales manager for Collins Canada, and prior to that was resident manager in Ottawa. In his new capacity, he will be responsible for co-ordinating company activities with government and military agencies, and for commercial sales and customer service. His office will be in Toronto.

Three senior appointments have been made at Ward Leonard of Canada Ltd.

W. R. Wiltshire becomes sales manager, **K. A. M. Hayes** becomes secretary-treasurer, and **J. H. Kluge** becomes manager of engineering. All three are long-time employees of the company.

M. B. Mairs has been appointed general manager of H. K. Porter Company (Canada) Ltd.

Mr. Mairs was formerly assistant general manager of the company. A graduate in metallurgical engineering from the University of Toronto, Mr. Mairs has been associated with Joy Manufacturing Co. in both Canada and the United States, Orinoco Mining in Venezuela, and American Smelting and Refining in New Jersey.



Mairs



Symonds

Victor V. R. Symonds has been appointed contracts manager for Litton Systems (Canada) Ltd.

Mr. Symonds has been assigned to the defence liaison office of Litton Systems at 165 Sparks Street, Ottawa. Before joining Litton Systems, he was with Bristol Aeroplane Co. of Canada Ltd., as Ottawa manager. He has a broad manufacturing, sales, contracts and administration background in the Canadian aircraft industry, having previously held executive positions with A. V. Roe Canada Ltd., Fleet Manufacturing Ltd., and British Overseas Airways Corp. He served with the Royal Canadian Navy as an air engineer officer in World War II.

Dr. B. G. Ballard has been appointed president of Canadian Standards Association

Dr. Ballard, vice-president (scientific) of the National Research Council, will serve a two-year term as head of the 3,600-member association.

Three appointments have been made at Douglas Randall (Canada) Ltd., Scarborough, Ont.

G. E. Geduld has been appointed general manager of the Canadian company. **D. W. Grierson** has been appointed applications engineer, and **R. Neill** appointed product manager (terminals and connectors).

Mr. Geduld, who was born and

educated in the United Kingdom, worked in the Radio Communications Laboratory of General Electric Co. Ltd., England. He spent two years in the RAF and then served in marketing capacities with metal alloy and electronic control firms prior to joining Douglas Randall (Canada) Ltd. in 1958 as sales manager.

Mr. Grierson was born in the U.K. and graduated in electrical engineering. In Canada he has worked for Canadian Aviation Electronics and Sperry Gyroscope Co. of Canada Ltd. Mr. Neill was born and educated in Toronto. Prior to joining the company, he was an industrial salesman with Aircraft-Marine Products of Canada.

Kenneth H. Tinker joins Whittaker Electronics Ltd. as Quebec and Maritimes manager.

Previously assistant purchasing agent with Sperry Gyroscope Co. of Canada Ltd., Mr. Tinker will be located in the new Montreal office of Whittaker Electronics at 5056 Chestnut Ave., Pierrefonds, Montreal. Telephone is MURRAY 4-3000.

James B. Turner and **William C. Hurley** receive appointments at MEL Sales Ltd.

Mr. Turner has been appointed vice-president and general manager of the company. In that position, he will be responsible for the overall company sales administration. Mr. Hurley has been appointed sales manager of Melcom, new components division of MEL Sales Ltd. In this position, he will be responsible for the marketing of precision and specialized components for the company.



Todd



Goodman

Two additional Canadians have been elected to board of directors of Minnesota Mining and Manufacturing of Canada Ltd.

R. T. Todd, manager, Electrical Products Div. and **H. J. Goodman**, manager, Printing and Reflective Products Div. have been elected directors. Mr. Todd started with 3M and associated companies in 1933 as a salesman and Mr. Goodman joined 3M in 1947 as a sales representative.

(Continued on page 50)

LITTON ALL-INERTIAL AUTOMATIC NAVIGATOR INSTALLED IN AN OPERATIONAL FIGHTER



NEW PROOF OF LITTON'S CONTINUING CONTRIBUTIONS TO THE DEVELOPMENT OF INERTIAL NAVIGATION IS FURNISHED BY THE LN-3-2B AUTOMATIC NAVIGATOR THAT IS NOW BEING INSTALLED IN CANADA'S CF-104 FIGHTER.

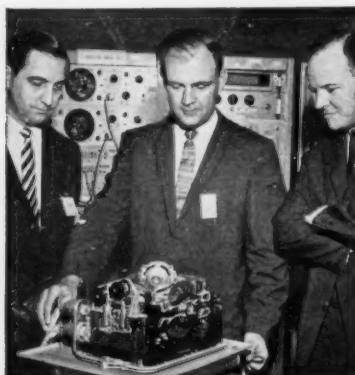
Three-hundred-and-sixty-degree freedom of aircraft maneuver on every axis is made possible by four-gimbal isolation of the Litton stable platform that keeps the system's accelerometers aligned in inertial space. Voltage signals from the accelerometers are transmitted to a computer where they are integrated to compute vehicle position components.

In addition, an adapter unit provides 27 outputs of pitch, roll and heading angles and ground speed to other equipment in the aircraft such as bombing computer and autopilot.

In flight, tight servo loops hold all sensitive elements of the stable platform at null regardless of acceleration. Any relative motion between the gyro case, which is fixed to the platform, and the floated gyro rotor, which is fixed in space, is sensed and corrected to keep the platform including accelerometers oriented to vertical and north. Any acceleration along an axis produces an accelerometer torquer current which is proportional to the applied acceleration. This torquer current holds the accelerometer at null, and the same signal is transmitted to the navigation computer.

Litton Systems (Canada) Ltd. is playing an increasingly vital role in Canada's CF-104 program. At its Rexdale facility the company is undertaking:

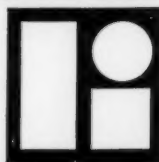
- The manufacture of electronic sub-systems for the LN-3.
- The final test and calibration of the complete LN-3 system.
- The design and manufacture of ground support and other special purpose electronic test equipment.
- The training of R.C.A.F. and industry personnel.
- After-sales service including provision of spares and field representation.
- Maintenance, repair and overhaul.



EXAMINING LN-3 STABLE PLATFORM UNDER TEST AT LITTON'S WOODLAND HILLS, CALIF. FACILITY ARE L-R: VIC SYMONDS, LITTON-CANADA; P. LITTON, LITTON-CALIF.; D. BELYEA, DDP.

These programs are being carried forward by engineers and technicians specializing in inertial navigation and related techniques.

If you have experience in fire control, analog, servo or gyro systems this may be your opportunity to gain further knowledge in this continuously expanding field in Canada with one of the world's leaders in inertial navigation systems. Opportunities also exist for field service representatives. To apply, write to Personnel Manager, Litton Systems (Canada) Limited, 123 Rexdale Blvd., Rexdale, Ontario.



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DIVISION OF LITTON INDUSTRIES
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Canadian professional engineers nearing long sought unity

Proposed confederation of the Engineering Institute of Canada and the Canadian Council of Professional Engineers into one national body under the name of the Canadian Institute of Professional Engineers (L'Institut Canadien des Ingenieurs Professionnels) has moved a step nearer realization.

Presentation of the final report of the Engineers Confederation Commission, by John H. Fox, P.Eng. chairman, and Leo Roy, P.Eng. vice-chairman, to the council and membership of the Engineering Institute of Canada in Vancouver on May 31 and to the Canadian Council representing the various provincial Associations of Professional Engineers on June 7 in Edmonton is seen as one of the final steps before the long-sought unity between the two engineering groups, representing 40,000 Canadian professional engineers, becomes an actuality.

The report needs to be ratified by both professional groups before confederation can take place. Although the report makes no recommendation for confederation, it does include a proposed constitution, bylaws and legal details and notes that if the two groups agree to join together,

Ottawa has been recommended as the head office site.

The report also recommends that the present charter of the Engineering Institute of Canada be amended by act of parliament if agreement for unity is reached, and that the amended charter be that of the new body.

Delta Electronics Ltd. sells its stock to two other companies

Ownership of Delta Electronics Ltd., Clarkson, Ont., manufacturer of multiple TV systems equipment, is now vested in Spartan Air Service and Kirkland Minerals Corp. Ltd. For 50% of Delta's common shares plus 21,500 preferred shares, Spartan paid \$121,500 worth of its common stock—based on the current market value of \$2.30 per share. The remaining 50% of Delta common stock was purchased by Kirkland for \$100,000 cash.

For Kirkland Minerals, the investment was the first move in its transition from the mining business into the industrial field.

But for Spartan, an Ottawa-based helicopter company active in airborne geophysical surveys and aerial photography, Delta is more than just

(Continued on page 43)

Ottawa report

Canada is planning to enter the U.K.-U.S.-France program for using satellites for trans-Atlantic telecommunications as a full-fledged partner and will undertake a certain amount of research and development work, sources report.

Following an announcement by Transport Minister Leon Balcer in the Commons on May 26 newspaper accounts described Canada's role in the project as that of an observer. However, it is reliably learned Canada plans to enter the agreement as a full working member.

Negotiations are now going on about the extent of Canadian participation. This will entail a certain amount of research work though of a relatively minor nature compared to the full program. One point under discussion is the amount of Canadian-originated research to be done here or in Britain.

In his Commons statement Mr. Balcer said a team of senior DOT engineers would be assigned to work with U.K. scientists. He added that he hoped "to be able to report in greater detail at a later time." Membership of the DOT team has not yet been decided.

The satellite telecommunications project is in part the result of a sales tour by British Aviation Minister Peter Thorneycroft last fall to try and interest Commonwealth countries in a program of research using the Blue Streak missile. This idea aroused little interest here and in other Commonwealth capitals. After the abandonment of the Blue Streak for its original military purposes, the British government, for obvious political reasons, has been eager to find other ways of employing the missile.

Meanwhile the United States has announced plans for "Project Relay" involving the firing aloft of an experimental telecommunications satellite in the fall of 1962. Trans-Atlantic transmission of television programs is involved in the same program.

DOT officials here estimate that it will take some seven years to perfect an operating telecom-

(Continued on page 51)



G. R. McGregor, president of Trans-Canada Air Lines, examines a read/write head for one of the large magnetic storage drums for TCA's new reservation system during a recent visit to the Toronto plant of Ferranti-Packard Electric Ltd. Looking on, from left to right are: G. W. L. Davis, manager of technical services in F-P's Electronics Division; T. Edmondson, president of F-P; C. J. Campbell, TCA director of communications; and E. G. Hazle, senior engineer at F-P. The twin computers and field equipment will be in operation later this year and will provide a two-second reservation confirmation from any point in Canada.

*another Sarkes Tarzian
production breakthrough!*

Specifications at 25° C			
Tarzian Type	Zener Voltage (V)	Test Current (MA)	Dyn. Imp. (MAX) (Ohms)
VR6	6	25	4.0
VR7	7	25	5.0
VR8.5	8.5	25	6.0
VR10	10	12	8.0
VR12	12	12	10
VR14	14	12	11
VR18	18	12	17
VR20	20	4	20
VR24	24	4	28
VR28	28	4	42
VR33	33	4	50
VR39	39	4	70
VR47	47	4	98
VR56	56	4	140
VR67	67	2	200
VR80	80	2	280
VR90	90	1	340
VR105	105	1	400



Tarzian Silicon Voltage Regulators now at workday prices

1-watt

Epoxy enclosed

6 to 105 volts, in 20% increments

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Immediate availability

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At the new low prices, more circuits can be better protected or improved in performance by the use of these small and inherently rugged devices as clippers, limiters, and regulators.

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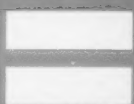
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EXCITING NEW EQUATION
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Bendix
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**MIL-C-26482 Type
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1. Industry acceptance.
2. Readily available.
3. Millions in use.
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5. Satisfies 95% of all connector applications.

MIL-C-26636 Type Contact

6. Use MIL-approved crimp tools.

7. Positive reliability.
8. Maintenance and design flexibility.
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MIL-C-26636**

11. No system redesign.
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Interchangeability, reliability, and availability are yours at minimum cost with this new, simplified Bendix Connector Combination. Check into it. We're sure you'll find profitable use for this latest development in our continuing program to provide both military and industrial users with the latest and best in electrical connectors.



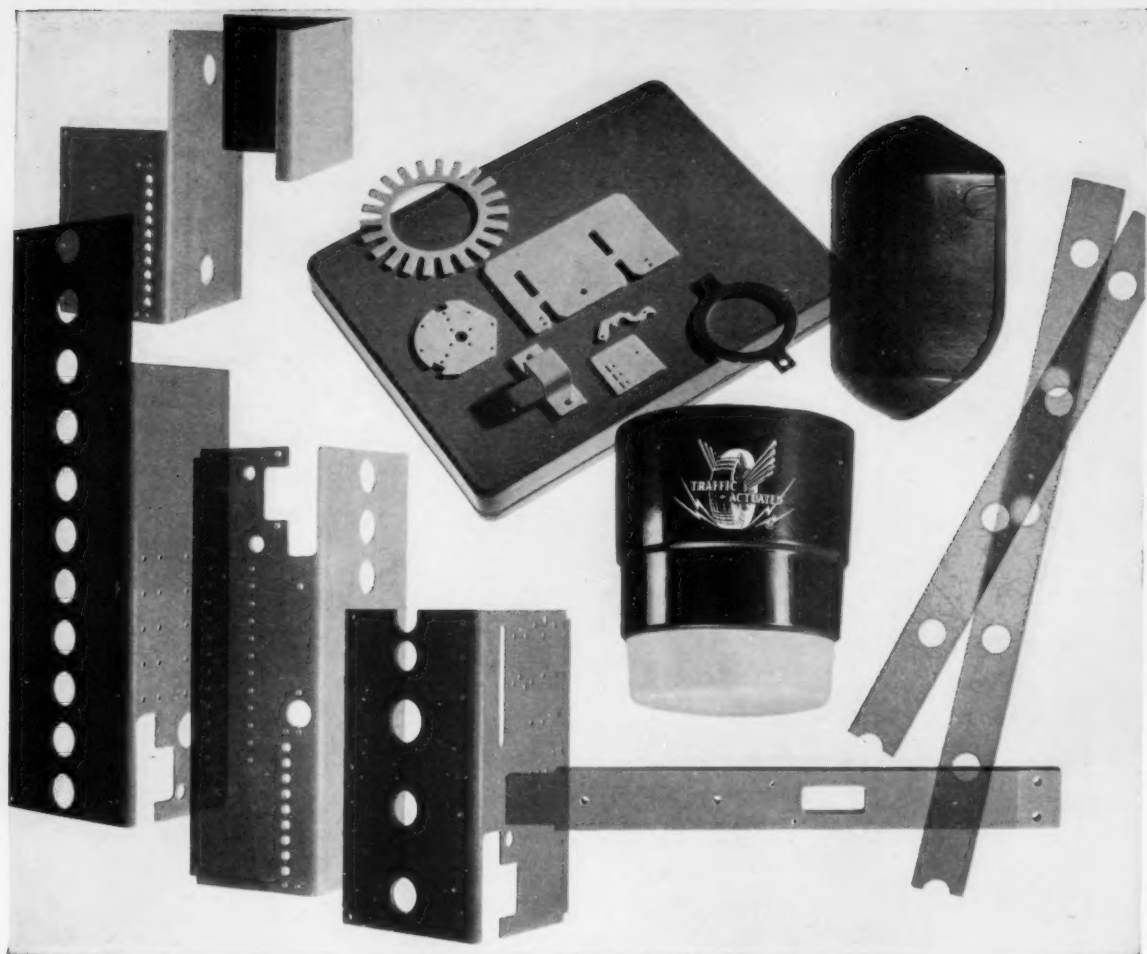
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Have you explored the full design potentials of molded polyester-glass?

Few materials offer the designer so many opportunities for product design simplification and cost reduction.

Added to the inherent toughness and strength of polyester-glass are good electrical and thermal properties, weather resistance—and flame retardance if you need it.

Using advanced molding and machining techniques, complex shapes and structures can be produced to reduce product weight or the number of parts, eliminate costly machining or stamping operations, simplify product assembly, improve product performance, life or reliability.

These are the kinds of results our customers are achieving. For a few thought-starters—and facts about National polyester-glass products and molding services—contact your nearby National Sales

Office, or write directly to Dept. 11-7, Toronto, Ontario.

116 Choices: One Source This is the latest count of the different plastics and grades National can offer in your search for the *one best material*. Add to this total *the one special grade* that can be developed from scratch to meet your particular need. This full range of materials is backed by complete engineering services . . . from application assistance up to and including the delivery of Canadian made, 100% usable, precision-fabricated parts . . . in any quantity, on time!

Call the National Sales Office near you. It's a direct line to single-source help on your current materials problem.



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CANADIAN ELECTRONICS ENGINEERING JULY 1961

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serves the communications field with a wide range of products which includes Micro-wave and Tropospheric Scatter Antenna, Radio Frequency Hardware, Towers and Tower Accessories. • Whatever the project — Bristol's Creative Engineering is at your service with a fully qualified design staff, comprehensive manufacturing facilities and an outstanding test and developmental laboratory. • You are invited to address your enquiries for product information or engineering assistance to

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WINNIPEG INDUSTRIAL DIVISION
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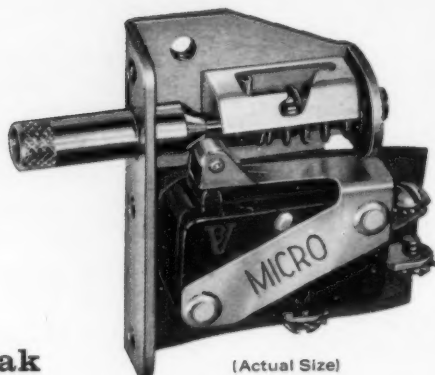
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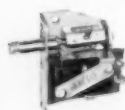


NEW

**DOOR INTERLOCK
SWITCH eliminates
momentary circuit break
during re-set**



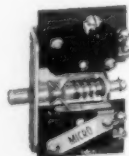
(Actual Size)



13AC Series



22AC Series



24AC Series



17AC Series



8AC Series

A new model in MICRO's line of protective door interlock switches, the "13AC" is designed to eliminate that momentary power interruption when the interlock is re-set upon closing the door. This feature is particularly desirable on electronic equipment such as data processing consoles, transmitters or computers.

Door interlock switch assemblies automatically break the power circuit when a door or drawer is opened, make it easy to intentionally energize the circuit for check or test, and eliminate the use of dangerous jumpers or tie-downs. When the door is closed, these devices automatically re-set so that next time the door is opened, power is safely cut off.

MICRO SWITCH door interlocks are the ultimate in reliability as protective devices on cabinets and enclosures containing electronic equipment that may be hazardous to personnel. More than 150 models include environment-proof and high temperature designs, subminiature and multi-circuit assemblies and some with self-lubricating thermo-plastic actuating rods.

A few of the many different door interlock switches available. Write for Data Sheet 178 to your nearby Honeywell branch or write Honeywell Controls Limited, Precision Components Division, Toronto 17.



Honeywell
MICRO SWITCH Precision Switches

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CANADIAN ELECTRONICS ENGINEERING JULY 1961

Measure and record DC current, 0.1 ma to 10 amps without breaking leads, without circuit loading!



New Φ 428B Clip-on DC Milliammeter with recorder output!

Now you can measure and record dc current to 10 amps without interrupting the circuit and with no circuit loading. You simply slip the jaws of the Φ 428B probe around a bare or insulated wire and read dc, even in the presence of equally strong ac on the same wire. No need to break leads. The 428B reads dc current directly in 9 ranges by sensing the magnetic flux induced by dc current in the wire.

To measure current difference between two separate wires just clip the probe around them both and read, then reverse one lead and read their sum! For even greater sensitivity you simply increase the number of lead loops through the probe, increasing sensitivity by the same factor as the number of loops.

The recorder/oscilloscope output, dc to 300 cps, makes it easy to record dc levels as well as analyze ground buss, hum and ripple currents on an oscilloscope—all without circuit loading.

Φ also offers Model 428A Clip-on DC Milliammeter. This instrument is similar to Φ 428B except that coverage is limited to 3 ma to 1 ampere (6 ranges), the recorder output is not included, and price is somewhat lower.

HEWLETT-PACKARD COMPANY

1066L Page Mill Road Palo Alto, California, U.S.A.
Cable "HEWPACK" Davenport 6-7000
Sales representatives in all principal areas

SPECIFICATIONS

Current Range: Φ 428A, 3 ma to 1 a full scale in 6 ranges
 Φ 428B, 1 ma to 10 a full scale in 9 ranges

Accuracy: $\pm 3\%$, ± 0.1 ma

Probe Inductance: < 0.5 uh introduced into measured circuit

Probe Induced Voltage: < 15 mv peak into measured circuit

AC Rejection: AC with peak value less than full scale affects meter accuracy less than 2% at frequencies above 5 cps and different from carrier (40 KC) and its harmonics. (On 428B 10 amperes range, ac is limited to 4 amperes peak)

Recorder/Oscillator Output: Φ 428B, approximately 1.4 v across 1,400 ohms full scale. Frequency response dc to 300 cps

Probe Insulation: 300 v maximum

Probe Tip: $\frac{1}{2}$ " x $9/32$ ". Aperture diam. $3/16$ "

Size: Cabinet, $7\frac{1}{2}$ " x $11\frac{1}{2}$ " x $14\frac{1}{4}$ "; rack mount, 19" x 7" x 13" behind panel

Weight: Cabinet, 19 lbs; rack mount, 24 lbs.

Price: Φ 428A, \$500.00 (cabinet); Φ 428AR, \$505.00 (rack mount)
 Φ 428B, \$550.00 (cabinet); Φ 428BR, \$555.00 (rack mount)



HEWLETT-PACKARD S. A.

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Cable "HEWPACKSA" Tel. No. (022) 26. 48. 86

7058

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cae

Jet fighter pilots on two continents are being trained in flight simulators designed and built by Canadian Aviation Electronics Ltd. and the Tactical Crew Procedure Trainer shown above will soon train RCAF crews to operate the complex electronic equipment in the Argus CP-107 submarine hunter on Canada's east coast.

CAE is designing and building F-104 Starfighter simulators for the governments of Canada, West Germany and the Netherlands to train pilots in those countries to carry out tactical missions with precision in aircraft which fly at more than twice the speed of sound.

Canadian Aviation Electronics Ltd. is a rapidly expanding, international company in Canada, engaged in the development and manufacture of electronic equipment for industry and defence, with plants in Montreal and Winnipeg. The company is responsible for the operational maintenance of the Western Section of the Mid-Canada Line and depot and field maintenance of the Pinetree Line.

Today CAE provides jobs for more than 1,500 in the electronics industry in Canada, and 300 in subsidiaries in the United States and Europe. Present commitments alone ensure several hundred additional Canadian jobs within the next twelve months.

cae

CANADIAN AVIATION ELECTRONICS LTD.

Montreal

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CANADIAN ELECTRONICS ENGINEERING JULY 1961



THE FINEST INSTRUMENT FOR ALL-PURPOSE TESTING ...

WESTON Model 901 Group Now better than ever

Weston's matched line of Model 901 portables are well known for sustained accuracy and dependability under general test conditions. This modern group of AC and DC multi-range instruments consists of ammeters, voltmeters and wattmeters covering a wide range of measurement.

Designed for critical use, the Model 901 DC series is now accurate to 0.25%. Hand-calibrated mirror scales are combined with knife edge pointers to eliminate parallax errors. Widely-spaced markings on 5.5-inch long scales facilitate readability. The Model 904 AC series is now stocked in multi-range, frequency-compensated versions only.

Excellent for field use, these portables are housed in rugged plastic.

Other features include wide, shadow-reducing windows which are specially treated against electrostatic effects, and self-shielded mechanisms that offer positive protection against external magnetic influences.

For your information, call or write Daystrom Limited,
1480 Dundas Hwy. East,
Cooksville, Ontario
5430 Ferrier Street,
Montreal 9, Quebec

A subsidiary of Daystrom Inc.,
or any office of Northern Electric Co. Ltd.

Weston Model 901 Group consists of: Model 901 DC Instruments; Model 904 AC Instruments; Model 902 AC Rectifier-Types; and Model 905 AC and DC Single Phase Wattmeters. Protective leather carrying cases are available for all models.



Daystrom-Weston Instruments are now
MADE IN CANADA, to Canadian Standards.



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WESTON INSTRUMENTS DIVISION

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World Leader in Measurement and Control

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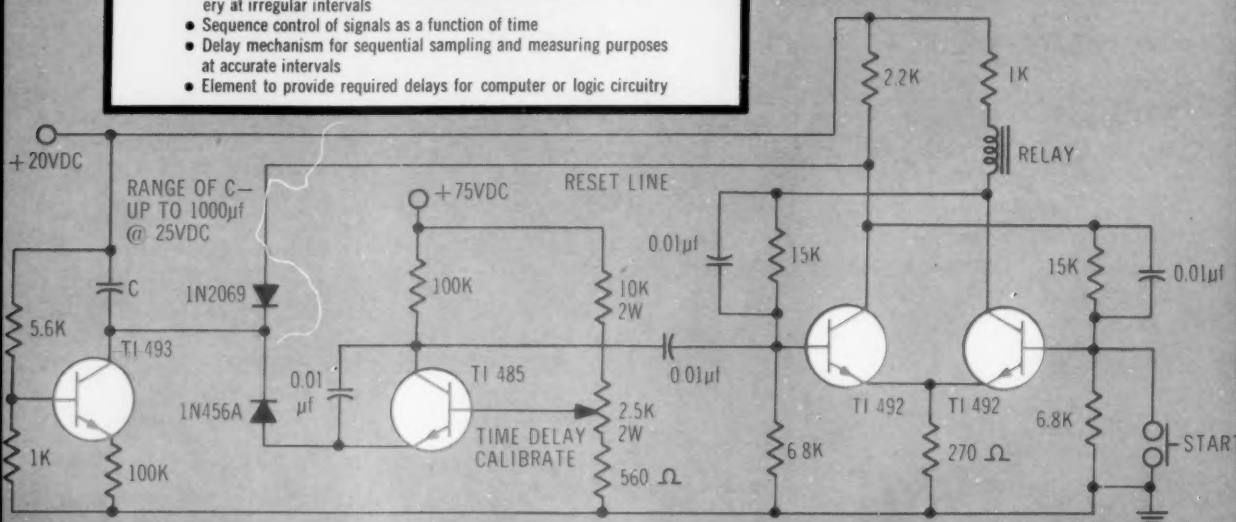
Variable Delay Timing Circuit

Typical Applications

- Safety device for sequential application of signals
- Warm-up delay mechanism for starting complex machinery
- Automatic on/off control to facilitate adjustment of process machinery at irregular intervals
- Sequence control of signals as a function of time
- Delay mechanism for sequential sampling and measuring purposes at accurate intervals
- Element to provide required delays for computer or logic circuitry

Features

Time Delay From 25 milliseconds to 3 minutes
Self Resetting or Externally Cycled
Temperature Range -40°C to $+125^{\circ}\text{C}$
ON/OFF Relay Actuator



HOW TO GET HIGH TEMPERATURE STABILITY AND INDUSTRIAL ECONOMY

With New TI Low-Cost Silicon Industrial Transistors...

You can assure your customers optimum circuit performance up to 125°C when you design-in new, low-cost TI silicon industrial transistors. Priced comparable to lower-temperature industrial devices, these new TI silicon industrial units provide the high performance your industrial designs require.

Get greater margins of operational safety by applying these new silicon industrial transistors to your process control, communication, aviation system, electronic instrumentation, and computer applications today.

CHARACTERISTICS					APPLICATIONS					
TYPE	MIN BV _{CEO}	DC Beta Range	MAX I _{CBO} @ 100°C	f _{αb} (typ)	Servo and Relay Driver	Audio Amplifier Medium-Speed Switcher†	Audio Amplifier Medium-Speed Switcher**	RF Amplifier (to 40 mc)	VHF Amplifier, High-Speed Switcher	Nixie® Driver
TI 480	50 v	9-36* @ 5 ma	50 μa @ 30 v	1 mc	TI 480					
TI 481	80 v	9-36* @ 5 ma	50 μa @ 30 v	1 mc	TI 481					
TI 482	20 v	>20 @ 30 & 150 ma	50 μa @ 10 v†	60 mc			TI 482	TI 482		
TI 483	40 v	20-60 @ 150 ma	50 μa @ 30 v†	60 mc			TI 483	TI 483		
TI 484	40 v	40-120 @ 150 ma	50 μa @ 30 v†	60 mc			TI 484	TI 484		
TI 485	20 v	15-60 @ 10 ma	20 μa @ 15 v†	200 mc					TI 485	
TI 486	80 v	20-80 @ 200 ma	300 μa @ 60 v‡	15 mc			TI 486			
TI 487	80 v	20-80 @ 200 ma	300 μa @ 60 v‡	15 mc			TI 487			
TI 492	40 v	15-45* @ 1 ma	50 μa @ 30 v	8 mc		TI 492				
TI 493	40 v	15-45 @ 10 ma	50 μa @ 20 v	20 mc		TI 493				
TI 494	40 v	40-125 @ 10 ma	50 μa @ 20 v	20 mc		TI 494				
TI 495	40 v	120-250 @ 10 ma	50 μa @ 20 v	20 mc		TI 495				
TI 496	40 v #	>10 @ 3 ma	75 μa @ 40 v	1 mc						TI 496

*AC Beta

† I_{CBO} @ 125°C

‡ I_{CBO} @ 150°C

§ 100 μa to 20 ma

**20 ma to 500 ma

BV_{CEX}

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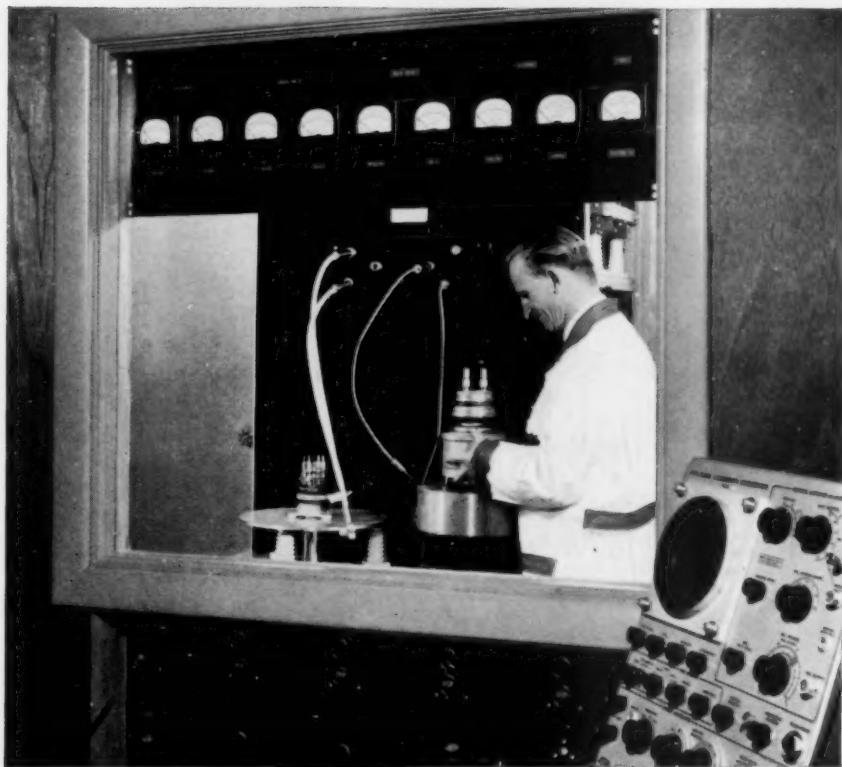
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Marconi's
NEW TEST LAB
 GUARANTEES PRE-TESTING
 OF EVERY SPECIAL PURPOSE TUBE
PLUS FAST
 WARRANTY ADJUSTMENT



Special Purpose Tubes are tested under simulated operating conditions at the new Marconi Test Lab in Toronto—only lab of its kind in Canada. Here a technician connects a BR1102 Tube in a special pressure-controlled test room.

This means new convenience in Special Purpose Tube service for you. If you are in one of the many industries now using Special Purpose Tubes in complicated equipment you know how important this can be . . . how your whole operation can be held up while you wait for replacement or adjustment of a faulty tube. This is because these tubes are normally imported by a distributor and shipped to the customer *without* testing. *Not so a Marconi Special Purpose Tube.* Every one is pre-tested in the new, fully-equipped Marconi Test Lab . . . sealed and protected by the Marconi warranty. If any trouble does occur, you can be sure of *immediate* warranty adjustment. Marconi electronics specialists will give you on-the-spot assistance. This service is as close as your phone.

ELECTRONIC TUBE AND COMPONENTS DIVISION

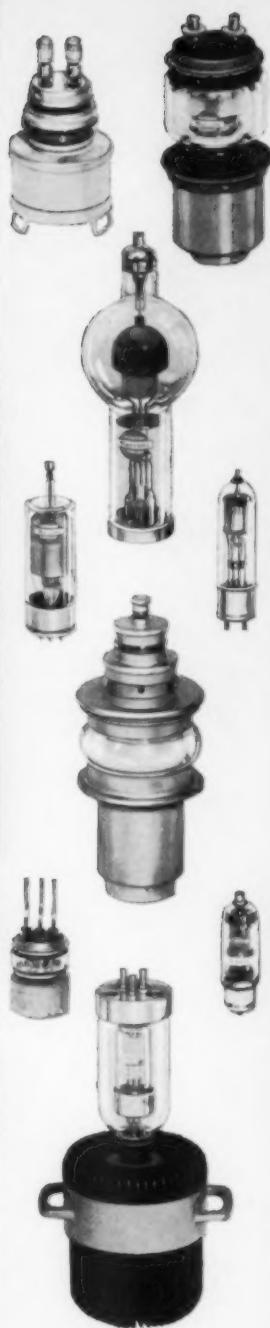
CANADIAN **Marconi** COMPANY

1830 BAYVIEW AVENUE, TORONTO, ONTARIO

Branches: Vancouver • Winnipeg • Montreal • Halifax

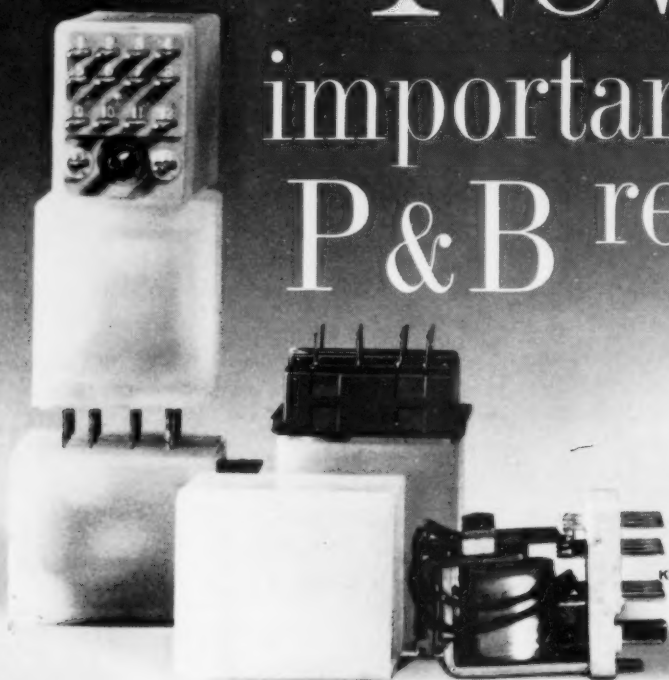
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CANADIAN ELECTRONICS ENGINEERING JULY 1961



Canadian Marconi has the widest and most complete range of Special Purpose Tubes in Canada. Marconi's extensive background of experience in electronic tubes and equipment can prove invaluable to you in the selection and use of proper tubes and components for your requirements.

a New and important P & B relay . . .

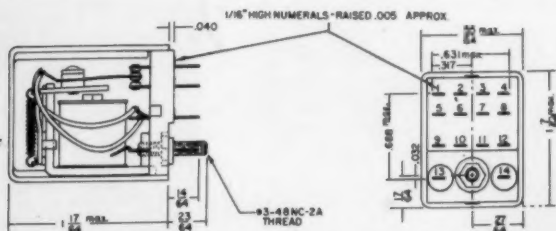


KHP SERIES SHOWN ACTUAL SIZE

having rare longevity

This small, 4-pole relay has the happy faculty of maintaining its original operating tolerances over an exceptionally long life. Example: tests (by customers!) show this relay has variations in electrical characteristics of less than 5% after more than 100 million operations.

But that's far from all. This is a *small* relay . . . about a one inch cube. This relay is easy to install using the conveniently spaced solder lugs or a socket. Thus you save time and production costs. This relay is versatile . . . its 4PDT contacts will switch loads from dry circuit up to 3 amperes. This relay—well, why not order samples and see for yourself! Order today from your P & B representative or write us direct.



KHP SERIES SPECIFICATIONS

CONTACTS:

Arrangement: 4 Form C, 2 Form Z.

Material: $\frac{1}{32}$ " dia. Silver standard. Silver cadmium oxide and gold alloy available.

Rating: 3 amps @ 30 volts DC or 115 volts AC resistive for 100,000 operations.

COILS:

Resistance: 11,000 ohms max.

Temperature: Operating Ambient: -45°C . to $+70^{\circ}\text{C}$.

Power: 0.5 watts min operate @ 25°C . 0.9 watts nom. @ 25°C . 2.0 watts max. @ 25°C .

TIMING VALUES:

Nominal Voltage @ 25°C .	Max. Values
Pull-in time	15 ms
Drop-out time	5 ms

INSULATION RESISTANCE: 1500 megohms min.

DIELECTRIC STRENGTH:

500 Volts RMS 60 cycles between contacts.
1000 Volts RMS 60 cycles between other elements.

MECH. LIFE: In excess of 100 million cycles.

SOCKET: Solder lug or printed circuit terminals.
Available as accessory.

DUST COVER: Standard.

TERMINALS: Solder lug and taper tab.

P & B STANDARD RELAYS ARE AVAILABLE AT YOUR LOCAL ELECTRONIC PARTS DISTRIBUTOR



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buy
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Effective July 1st, the complete LICON line of miniature and subminiature precision switches will be available **only** from the LICON SWITCHES AND CONTROLS DIVISION of Canada Illinois Tools Limited. For our catalogue — detailing Canada's most complete switch line along with dimensional data and engineering specifications — write:

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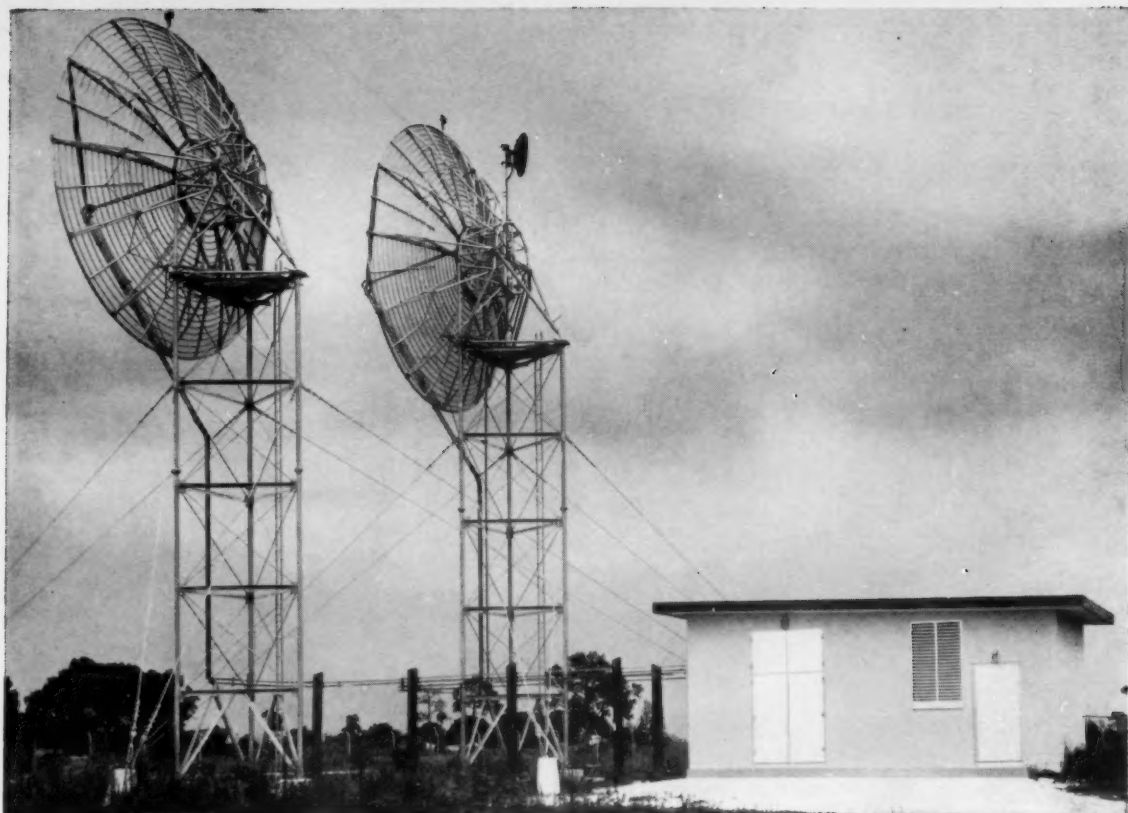
Licon Switches are made in Canada

Jobber Enquiries are Invited



6105

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NOW IN SERVICE

ON THE 4400-5000 M.C. BAND . . .

WESTINGHOUSE MICROSCATTER BRINGS YOU 4 OPERATING ADVANTAGES AT THIS HIGHER FREQUENCY

Canadian Westinghouse Company Limited—pioneers in tropospheric scatter at 5000 mc—have supplied equipment for service throughout the world. Operating results substantiate FOUR basic advantages for long range multihop trunk systems.

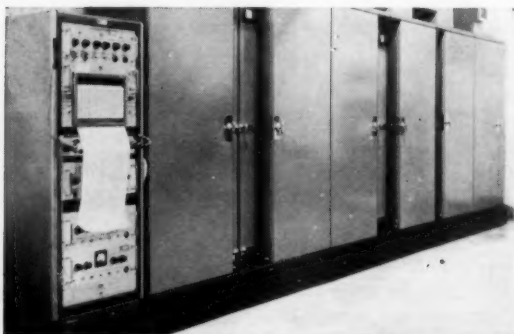
1. SIZE—Compact radio equipment allows trailer or fixed station installation. Small antennas, 10-28 feet in diameter with high gain. Close antenna

spacing, minimum 18 feet centre to centre.

2. PRIMARY POWER—27 kw for 2 kw Quadrupal Diversity terminal, or 14 kw for 2 kw Dual Diversity terminal.

3. FREQUENCY—4400-5000 mc . . . World Wide Licensing and assignments readily obtained.

4. UNATTENDED SITES—Designed for remote operation with proven reliability.



To relate MICROSCATTER to your problem, contact a Westinghouse communications specialist or write to Canadian Westinghouse Company Limited, Electronics Division, Hamilton, Canada.

CANADIAN
Westinghouse
Microscatter

61-A 745

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CANADIAN ELECTRONICS ENGINEERING JULY 1961



the nuts and bolts of line hardware service

There's nothing ordinary about pole line hardware, be it nuts or bolts, anchors or insulators. Not at AUTOMATIC ELECTRIC. We realize that hardware is as basic to communications as the telephone or the cable. (We also sell telephones and cables.) But because we know the importance of the nuts and bolts of the business, every line hardware order gets red carpet treatment. (Just the same as orders for telephones, cables, or hundreds of other AE products.) ● AUTOMATIC ELECTRIC is your single source of supply for everything in pole line hardware. Choose from famous names like Slater, C.L.M., Kearney, Chance, and others. Order all your supplies from AUTOMATIC ELECTRIC—the company that takes the "hard" out of hardware ordering. For full information write Automatic Electric Sales (Canada) Limited, 185 Bartley Drive, Toronto 16, Ontario. Branches across Canada.

*AUTOMATIC ELECTRIC sells everything
in pole line hardware.

AUTOMATIC ELECTRIC

Subsidiary of

GENERAL TELEPHONE & ELECTRONICS



6134

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*Alberta
Government
Telephones
install*



STROWGER AUTOMATIC TOLL TICKETING IN RED DEER

Direct Distance Dialing has now been inaugurated at Red Deer, by Alberta Government Telephones. This follows only a year after a similar event at Penticton, British Columbia. The equipment for both installations, selected for utmost economy and reliability, was designed and manufactured in Canada by Automatic Electric. ● The popularity of the AE Strowger Automatic Toll Ticketing system and its revenue earning potential are already thoroughly established. SATT equipment is completely compatible with other switching equipment in use in both Canada and the United States. It provides tremendous flexibility . . . can meet *all* today's DDD requirements . . . is designed for easy, economical adaptation to tomorrow's needs as well. And because of its basic simplicity, new units can be quickly added the minute expansion needs arise. ● *If you would like more information on reliable, economical SATT equipment, call or write Automatic Electric Sales (Canada) Limited, 185 Bartley Drive, Toronto 16, Ont. Branches across Canada.*

AUTOMATIC ELECTRIC
Subsidiary of
GENERAL TELEPHONE & ELECTRONICS





Newly-elected senior officers of EIA pose for CEE's photographer before the first meeting of the 1961-62 Board of Directors. From left: W. S. Kendall, vice-president and chairman, Electronics Division; David Knapp, first vice-president and chairman, Components Division; J. D. Houlding, president and chairman of the board; D. C. F. van Eendenburg, vice-president and chairman, Receiver Division; Fred W. Radcliffe, general manager and secretary.



Hon. George Hees, Minister of Trade and Commerce, addresses the 32nd Annual Meeting of EIA. Mr. Hees promised full support for all export activities.

EIA annual meeting focuses attention on problems of electronics industry

Houlding named president of EIA for 1961-62

John D. Houlding, president of RCA Victor Co. Ltd., Montreal, is the new president of the Electronic Industries Association of Canada. Mr. Houlding was chosen to lead the 110-company membership at the Association's 32nd Annual Meeting in Ottawa last month.

John Draper Houlding was born in London, Ontario in 1921. A brilliant student, he attended the University of Western Ontario on scholarships, was an honours graduate in physics and chemistry. He served with the Royal Navy during World War II in the North Atlantic and the Mediterranean as a radar officer.

In 1945 he joined Canadian Westinghouse Co. Ltd. and worked on electronics engineering. He became seriously interested in the sales end of the business at the time of the Korean War and developed market forecasts which indicated a thorough knowledge of the potential in the Canadian electronics market. On the strength of his findings, the company set up an electronics division and made him the first sales manager. He later became manager of the division and then moved over to manage the industrial products division. Subsequently, when the company decided to enter the nuclear energy field, John Houlding was picked to form the new division and manage it.

In 1957 when RCA Victor Company began to make a number of management moves it called upon Mr. Houlding to become vice-president in charge of technical products. In the following year he was appointed vice-president and general manager of the company, the position he held until moving into the president's chair early in 1960.

Mr. Houlding was named first vice-president of EIA last year and was chairman of its burgeoning Electronics Division for two years. He succeeds James Key, general manager of Aerovox Canada Ltd., Hamilton.

The Electronic Industries Association of Canada at its 32nd Annual Meeting held in Ottawa June 16 revealed the results of a survey of 1960 member company reports which shows profits have dropped to alarmingly low levels, reflecting the pressures on the industry from importation and from reduction of defence electronic equipment purchases in Canada.

The survey reveals that the total of amounts retained in business and those paid out in dividends as a percentage of the sales dollar for the year 1960 sank to an all-time low of 1.52%. This compares with 2.3% reported recently by the Canadian Electrical Manufacturers Association and 4.4% by the Canadian Manufacturers Association (another all-time low).

Such low profit after taxes, claims EIA, is quite inadequate to provide for the research needed to ensure a flow of new production and for the capital investment to support future growth and employment.

Tax concessions on research in the recent budget may provide some relief (see page 5), but they do not offer a solution to the basic problems of the industry.

Quotas on radios and tubes

The following is the text of a resolution passed by the board of directors of EIA in Ottawa:

"That the Association appreciates the Government's recognition of the serious position of the industry due to imports and although action by the Government has been encouraging, the Association must emphasize that the 1961 quotas as established by Japan are unsatisfactory for the following reasons:

1. The radio receiver quota of 395,000 units with three or more transistors exceeds by approximately 25,000 units the actual imports during 1960 and is of such magnitude as to supply the entire 1961 Canadian market.
2. The 395,000 quota entirely ignores the fast-growing

importation of radio receivers of the tube type such as ac-dc sets, clock radios, auto radios and radio-phono combinations. It is estimated that 100,000 radios of the tube type entered Canada from Japan in 1960. Such are not provided for in 1961 in any quota.

3. The growing importance of imports of radios of other than transistor types will bring in substantial quantities of radio tubes not in the 2,500,000 tube quota, thereby circumventing the intent of the quota by at least 20%."

A special committee of industry experts has been established to work closely with the Government on these problems. EIA is urging the Government to put into effect a suitable means of Canadian measurement of the imports of these non-quota radios so that further industry injury can be forestalled.

President's report

Retiring president James Key touched upon some of the highlights of the Association's year in his report to the Annual Meeting.

One of his most pleasurable duties was to welcome the representatives of four new member companies: Robert Bosch Canada Ltd., Canadian Nameplate Co. Ltd., Standard Telephones & Cables Mfg. Co. (Canada) Ltd., and Sperry Gyroscope Co. of Canada Ltd. He also welcomed Federal Wire & Cable Division, H. K. Porter Co. of Canada Ltd., which has renewed its membership after a short absence.

Referring to importation problems he quoted two examples of how other nations protect their industry. The Australian duty on Japanese radios is approximately \$11 plus 45% ad valorem. In New Zealand the effective rate is close to 80% ad valorem.

Turning to other activities, Mr. Key mentioned the significant progress made in several areas:

- Completion of the Industry Brochure as an effective piece of advertising telling the story of the industry's achievements, capabilities and products.

- Increased activity and services performed under the guidance of the Director of Engineering and the continued co-operation of the Association with CRTPB and DOT.



Presentation of amusing "rewards" for outstanding service to the Association have become a feature of the Annual Industry Dinner. Ralph Hackbusch (left), director of engineering, receives from retiring president James Key a shield commemorating his efforts to relate industry standards to DOT specifications on the frequency tolerance of land mobile communications equipment.

- An extensive re-organization of the Components Engineering Panel.

- The continuing service to members of the Industrial Relations Committee in the interpretation of labor agreements and the discussion of mutual problems.

Mr. Key paid tribute to Ralph Hackbusch, director of engineering; Fred Radcliffe, general manager, and his staff; the members of the board; and the chairmen and members of all committees for their work during the year. He concluded:

"I am confident that the vigor, enthusiasm and co-operative spirit you have shown in meeting the challenge of today, will enable us to meet the challenge of tomorrow. We must continue to press for greater recognition of an industry that is vital to our country's progress. We have now entered the "space age"—great opportunities lie ahead—let us look forward with optimism."

Tube importer replies to EIA and press criticism

The editorial comment on page 37 of the May 1961 issue of CEE ("Radio, tube importers distort the facts") included an invitation to importers to use our pages to present their case. Mr. Stephan R. Lewar of Hit-Ray Electronics, Toronto, has submitted the following article on tube imports. Further comments are invited.

After the recent press release by EIA a number of articles appeared in trade publications, national magazines and the daily press. The main theme of these articles was to present "profiteering importers" who are "twisting the facts and applying the familiar trick of half-truths" in opposition to the virtuous approach of EIA. Examination of the following paragraphs taken from two of these articles will show how they stand up to closer scrutiny.

"It points out that Japan has seized domination of the high-volume Canadian market for radios and tubes . . ." Canadian Electronics Engineering, May 1961.

"Japanese TV tubes, said the companies, have won 29% of the market, compared to only 1.3% in 1958. Already almost 40% of all radios sold in Canada are Japanese. One result: jobs available in radio-TV manufacturing in Canada have dropped from 25,000 to 18,000 in the past four years." Time, Canadian edition, May 5, 1961.

The total consumption of tubes in 1960 (shipment of Canadian manufacturers plus imports) was 24,580,255 and imports from Japan totaled 3,948,006. Simple calculation shows that Japanese tubes accounted for 16.1% of the market. This is a far cry from the 29% mentioned in Time Magazine, and certainly is not the "domination of the Canadian market" mentioned in Canadian Electronics Engineering.

Yearly importation of tubes from Japan in 1959 and

1960 increased by 3,735,004. At the same time, Canadian production dropped 3,041,824 and imports from the United States were 1,617,554 less. It is impossible to determine exactly how many tubes of Canadian and U.S. production were replaced by tubes imported from Japan. However, it would be interesting to have a closer look at the effect of this importation on Canadian employment.

Hitachi's Mobara Works in Japan last year produced some 36 million tubes, employing less than 1,000 workers. I do not know the productivity of Canadian factories but it must be clear to everybody that the drop in production of two or three million tubes cannot by itself cause the widespread unemployment suggested by EIA ("Jobs in Canadian radio-TV manufacturing have dropped from 25,000 to 18,000 in the past four years."). Using the productivity of Japanese factories as a yardstick, imports from Japan may have affected between 60 and 80 jobs. Obviously every lost job is a tragedy to the worker involved, but to represent a drop in employment of 80, 100 or even 150 workers as a national calamity shows a lack of proportion and can only be considered as an attempt to deceive the public. This also applies to the implication that a loss of \$1½ million or \$2 million of tube business, which is surely much less than 1% of the business of the companies involved, puts the industry "in jeopardy".

Fair market value

Much was said about whether the tubes imported from Japan are sold at a fair market value. The industry contends they are not and as "proof" points to the fact that the average price of a tube imported into Canada from Japan is much lower than the average price shown on Japanese statistics. To compare average tube prices without taking into consideration the types and quantities involved can be highly deceptive. To show the extent of such deception it is sufficient to point out that by using this method it could be proved, for example, that Canadian tubes are cheaper in October than in February! According to the Dominion Bureau of Statistics the average price of a Canadian tube shipped in February 1959 and 1960 was 78c and 76c respectively while in October 1959 and 1960 the average price was 66c. Using the same method even further we could prove that in the last four years the price of tubes from Japan dropped 90% while the price of tubes from Holland increased by 25%. In 1957 the average price of a tube from Japan was \$3.50 and in 1960 it was 31c, while in 1957 the average price of a tube from Holland was 32c and in 1960 was 40c. Of course, all these deductions are false and are made only to show how it is possible to arrive at almost any conclusion if one wishes to juggle with figures.

The Canadian Customs authorities conducted two investigations into the fair market value of tubes imported from Japan, one in 1951 and the other in 1960. Since they found it satisfactory, I believe it is unfair for anyone to make statements to the contrary with no proof whatsoever. Strangely enough, almost every Canadian company complaining about these imports and the unfair prices are either themselves importers of tubes at a lower price or their parent or sister companies are so engaged.

EIA brief

The brief presented by EIA is not signed by its individual members. However, their names are appended at the end, indicating that they endorse the views and opinions expressed. It is of more than fleeting interest to note two of the tube-manufacturing firms import Japanese tubes. Customs regulations require a declaration by the importer that all the information given on Customs invoices (including fair market value of the items

imported) is true to the best of his knowledge and belief. Apparently, the members of these firms responsible for imports feel that the prices quoted for Japanese tubes is the fair market value, while other members of these same firms endorse EIA's brief. A curious situation, to say the least!

This may be a good opportunity to mention that the average price of tubes imported by Canadian industry from the Netherlands in the years 1955, 1956 and 1957 was comparable to the average price of tubes imported from Japan in 1958, 1959 and 1960. I assume everybody knows that the tubes imported from the Netherlands were resold at a higher price than those imported from Japan. Why then, should the importers be charged with profiteering when they are satisfied with less profit than the industry makes on the above mentioned tubes?

There is little doubt that Canadian industry in general and the Canadian electronics industry in particular are facing serious problems and have to find ways to survive against competition both from countries with large mass production and from countries with low wage levels. It is clear that in view of the limited market in Canada and the high wage level, it is impossible to produce economically all the items we require.

If we accept the principle that some industries will have to be protected should they be unable to face competition from abroad (and no doubt this has some merits), the decision as to which industries are to receive protection and the extent thereof will have to be determined by the Government. The Government can take a broader economic viewpoint than that which might be taken by interested producers.

Quota considerations

We all know a tight quota on tubes was arranged. Presumably before imposing it the Government obtained certain figures which have, until now, been jealously guarded (for example, the Canadian content in a so termed "Made in Canada" tube; imports of parts for the production of tubes, including picture tubes, amount to \$6½ million yearly). Moreover, the meaningless word "bulk" which appeared in a statement in Canadian Electronics Engineering ("The bulk of our imports from the U.S.A. are specialized types not made in Canada"), was probably replaced with the exact number. Anyone examining the tubes sold by Canadian manufacturers on the replacement market, as well as those supplied to O.E.M. accounts, will probably find that quite often these are made in the United States, notwithstanding the fact that the same type is produced in Canada.

All these questions were, I hope, answered before the import quota was established, since imposing the restrictions without their having been defined would indicate thinking along lines comparable to those exhibited in the famous remark Mr. Charles Wilson once made: "What is good for General Motors is good for the United States".

I have endeavoured in these few paragraphs to repudiate the statements which have been made about importers, and to show that the remarks are grossly unfair. The particular quotations contain reference to both tubes and radios. This reply is confined to the tube import business only, in which I have been engaged from what might be termed "the ground up" and concerning which I am fully conversant with the true facts.

While I am reasonably familiar with the radio import business, my knowledge is in no way as complete in this regard as it is in the matter of tube importation. For that reason, I do not feel adequately qualified to reply to the accusations made on the subject of radio imports (which are as totally unfair as those made regarding the importation of tubes), and I am leaving the matter of a reply to one of the interested parties. END

Final figures for the calendar year 1960, just released by the U. S. Department of Commerce, indicate that Canada's imports of electronic components and equipment reached \$92 million, 13½ % more than the 1959 total. Similar data specially prepared for CEE by H. M. Customs and Excise show that imports from the U. K. increased over the same period from \$14.3 million to \$15.9 million, a gain of 11 %.

Electronic imports from the U.S. and the U.K. increased again in 1960

The table below and opposite has been prepared to show the specific Canadian markets which United States electronics manufacturers are penetrating. Based on reports of the U.S. Department of Commerce, it shows the value in U.S. dollars of their exports to Canada of various electronic commodities in 1959 and 1960.

It should be noted that the figures shown are approximate, since the total of low-valued shipments is estimated; in many cases the total shown will be on the low side. Re-exports of foreign merchandise, previously imported into the United States but not substantially changed by processing while in that country, are also excluded.

Also note that for security reasons it is not possible to give the Canadian figures for several product groups. These include communications transmitters, receivers and transceivers; airborne direction finders; detection and navigational apparatus; electron tubes other than receiving types.

The table given on page 30 presents similar, but some-

what less detailed information on Canada's imports in 1959 and 1960 from the United Kingdom. It is based on statistics recently prepared for CEE by Her Majesty's Customs & Excise.

Here again some approximation is implicit, since the original figures in pounds sterling have been converted to their dollar equivalents. The rate of exchange was not constant over the two-year period and it was therefore necessary to choose an arbitrary value. This was set at 2.66 dollars to the pound sterling, the value used in converting similar export figures for 1958 and the first nine months of 1959 published in our April 1960 issue. The resulting dollar figures are therefore on the low side, since the rate has been around \$2.75-\$2.80 for some time.

The recent drop in the value of the Canadian dollar on international markets will, of course, further increase the cost of imports — the rate of exchange at press-time was up to \$2.86.

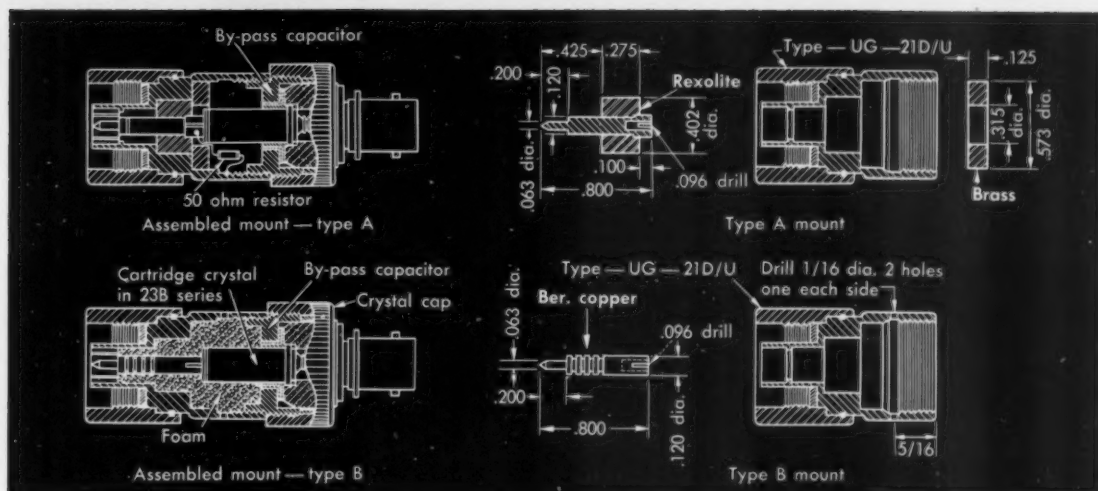
Electronic imports from the U.S.

Classification	1959, \$	1960, \$
Batteries, dry, multiple cell, except flashlight	797,272	749,681
Other dry and wet cell batteries	163,466	216,977
Electrical quantity indicating instruments (electrical or electronic type), nonrecording, not elsewhere classified (nec)	1,299,086	1,515,105
Electrical quantity recording instruments (electrical or electronic type), nec	606,112	629,261
Signal generators	813,806	927,612
Waveform measuring, analyzing and/or testing instruments, except optical	1,023,521	1,509,334
Electrical and electronic characteristics testing instruments, nec, and specially fabricated parts and accessories, nec, for electrical and electronic quantity and characteristics measuring and testing instruments	4,192,694	5,498,536
Electric motors, nec, 1/3 hp and under	2,456,053	2,278,592
X-Ray tubes and valves, medical, dental, and industrial	557,653	583,798
Parts and accessories, nec, specially fabricated for X-Ray tubes and valves	9,854	34,432

Classification	1959, \$	1960, \$
X-Ray apparatus, nec, and specially fabricated parts and accessories	2,522,409	3,085,801
Radio broadcast (am and fm) transmitters, transmission lines and antennas, including microwave studio-transmitter link equipment, and specially fabricated parts and accessories	404,696	339,417
Television broadcast transmitters, transmission lines and antennas, including microwave studio-transmitter link equipment, and specially fabricated parts and accessories	179,447	476,450
Radio and television broadcast audio equipment (including closed circuit), and specially fabricated parts and accessories	96,122	289,633
Television broadcast studio equipment (including closed circuit), and specially fabricated parts and accessories	2,043,738	2,675,041
Radio beacon (beam) transmitters, and specially fabricated parts and accessories	177,117	44,400
Automobile radio receivers (except communication receivers)	470,727	422,023
Radio-phonograph combinations with cabinets, combining phonograph with am radio or fm radio, not incorporating television	135,474	136,622
Other radios with cabinets, including am radios or fm radios, not incorporating television	1,374,148	856,597
Radio receiver chassis (without cabinets), not incorporating television	203,091	267,794
Television receivers with cabinets, with or without picture tubes or other tubes	1,708,709	2,043,088
Television receiver chassis (without cabinets), with or without picture tubes or other tubes ..	224,120	241,001
Receiving-type tubes	4,453,639	4,063,002
Television camera tubes (cathode-ray)	233,086	129,320
Television picture tubes (cathode-ray)	819,523	291,534
Other cathode-ray tubes	183,917	368,581
Parts and accessories, specially fabricated for electron tubes	1,722,643	1,743,332
Crystal diodes and transistors (semi-conductors)	1,548,193	2,646,547
Capacitors	2,320,164	2,553,359
Resistors	1,340,553	1,734,296
Inductors (including transformers and coils)	940,226	943,018
Loud-speakers	613,695	484,903
Carrier current equipment (high-frequency wire transmitting and receiving apparatus) and specially fabricated parts and accessories	958,037	170,857
Amplifiers and amplifying systems, audio frequency, including public address systems, and specially fabricated parts and accessories	802,581	795,843
Amplifiers (except audio frequency), and specially fabricated parts and accessories	297,885	393,048
Recorders (disc, tape, and wire), and specially fabricated parts and accessories	2,770,285	2,560,138
Electronic equipment, nec, and specially fabricated parts and accessories, nec	15,829,004	19,032,120
Telegraph apparatus (wire), and specially fabricated parts and accessories	3,491,305	3,086,580
Telephone instruments	232,424	239,517
Telephone equipment (wire), and specially fabricated parts and accessories	6,207,146	11,555,603
Electronic industrial process control systems	462,019	284,676
Industrial process indicating (measuring), recording, and/or controlling instruments, nec, and specially fabricated parts and accessories (CEE estimate of electronic portion of total imports)	3,152,839	3,653,993
Indicating (measuring), recording, and/or controlling instruments, nec, and specially fabricated parts and accessories (CEE estimate of electronic portion of total imports)	2,318,891	2,202,703
Electronic computers, related information processing machines, and accessories, nec	1,822,407	2,229,396
Parts, nec, and tape, specially fabricated for electronic computers, related information processing machines, and accessories	583,257	793,530
Nuclear radiation detection and measuring instruments, nec, and specially fabricated parts and accessories	677,832	1,315,054
Geophysical and mineral prospecting equipment, nec, and specially fabricated parts and accessories (CEE estimate of electronic portion of total imports)	1,816,798	1,411,899
Communication and signal wire and cable	725,907	737,825
Coin-operated phonographs, new	1,039,587	681,608
Coin-operated phonographs, used or rebuilt	28,437	39,317
Phonographs (except coin-operated), new and used or rebuilt	268,706	234,798
Parts and accessories, nec, specially fabricated for phonographs	1,804,905	991,561
TOTAL	\$81,005,206	\$92,189,153

Electronic imports from the U.K.

Classification	1959, \$	1960, \$
Electronic and nucleonic valves and tubes		
Thyratrons, hot cathode mercury vapour and gas-filled rectifiers (excluding mercury-arc rectifiers), photo-electric cells (excluding photo-transistors), stabilizing and cold cathode tubes, magnetrons, klystrons (See Note 1)	66,210	116,027
Cathode ray tubes	11,175	22,246
Other types not exceeding 50 watts plate dissipation (excluding X-ray tubes)	691,554	208,914
Other types (including X-ray tubes)	(See	593,305
Transistors (including photo-transistors)	Note 2)	2,780
Parts for tubes and valves (excluding glass bulbs)	6,823	16,625
Note 1. Photo-transistors included in 1959.		
Note 2. Classifications apply to 1960 figures only; 1959 figure is equivalent sub-total.		
Apparatus for telegraphy, telephony, radio, television and radar (including tubes forming part of the apparatus and exported therewith)		
Radio transmitters for public broadcasting, complete		76,286
Television transmitters, complete		343,321
Radio communication, navigational aid and radar equipment, complete	3,574,622	5,082,481
Domestic radio receivers, mains, complete	8,985	27,329
Domestic radio receivers, battery, complete (including vibrator sets)	4,719	58,438
Domestic radio receivers, other, complete (including mains/battery and auto)	198,130	143,816
Radio-phonographs, complete	12,550	2,437
Radio receiver and radio-phonograph chassis, substantially assembled	3,237	2,426
Television receivers and chassis substantially assembled, with or without sound reception ..	6,857	468
Public address equipment	30,723	12,717
Loudspeakers and microphones, separately consigned	333,705	324,837
Other radio and television apparatus, nec	127,068	727,388
Components and parts, nec	1,648,115	1,844,840
High frequency induction and dielectric cooking and heating equipment	31,212	24,988
Electro-medical apparatus (excluding deaf aids, X-ray apparatus and batteries)	52,570	57,419
Industrial electronic control equipment	182,872	95,393
Radio testing equipment, nec	296,574	207,690
Primary batteries and/or cells for radio	160	439
Primary batteries and/or cells for telephone, telegraph and signaling	822	15,917
Telegraph and telephone equipment, complete (excluding test equipment)	2,196,386	1,556,292
Telephone instruments, separately consigned	306,834	310,632
Parts for telegraph and telephone equipment, nec	1,222,584	1,087,187
Line apparatus for long distance communication (carrier, duplex and repeater) and speech input equipment	1,025,781	426,856
Telegraph and telephone test equipment, nec	68,976	75,009
Musical instruments and phonographs (including record players and tape recorders)		
Phonographs (including record players) with electrical amplification, complete (including tubes exported therewith)	39,349	20,719
Record playing mechanisms, without electrical amplification, complete, whether or not in cabinet, with record changers	1,804,847	1,965,370
Ditto, without record changers	47,226	56,607
Parts and accessories for phonographs, record players and mechanisms (including styli but excluding records)	218,043	151,785
Tape recorders and tape reproducers, complete (excluding office machinery)	58,400	82,351
Tape decks and other parts, nec	17,849	40,350
Recording tapes of all materials	11,691	97,422
TOTAL	\$14,306,639	\$15,879,107



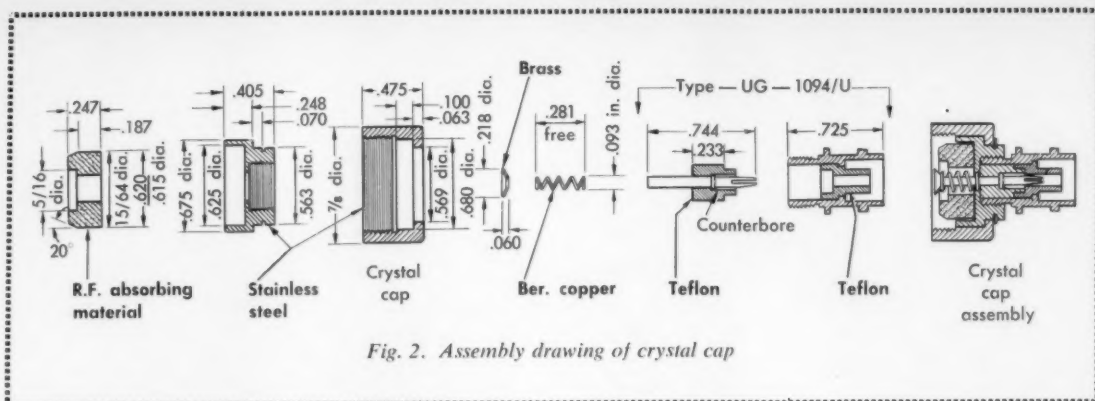


Fig. 2. Assembly drawing of crystal cap

Design considerations

The well-known^{1,2} equivalent circuit of the crystal rectifier is shown in Fig. 3.

Where r = spreading resistance of about 30 ohms

L = catwhisker inductance

R, C = barrier resistance and capacity, both of which vary with applied voltage or current.

R is about 5k to 20k and can be reduced to about 600 to 700 ohms by applying forward bias¹. C is about 0.20 pf to 0.5 pf. Reactance at 3 Mc is 260 to 100 ohms. These values would indicate that the input RF impedance of the crystal itself is considerably higher than that of 50-ohm coaxial line, even when modified by the cartridge and catwhisker.

One method of reducing the effective impedance is the addition of a shunt 50-ohm resistor at the crystal input tip, as in the Type A mount. A second method, used in the

Type B mount, is an attempt to raise the impedance of the coaxial line as much as possible, without undue modification of the Type N connectors. This is achieved by removing the dielectric material and replacing it with a foam which has very low dielectric constant, less than 1.1.

Type A crystal mount

The Type A crystal mount is made by modifying a Type N connector, UG-21D/U, as shown expanded in Fig. 1. The following changes are made to the connector:

1. The centre pin and teflon insulator are replaced with a polystyrene insulator and a new pin, which are pressed into place. The pin is made with a slotted cup to accept the tip of the crystal, otherwise it is the same as the original Type N pin.

2. A brass ring is pressed into the body of the connector to improve the impedance match around 2,000 Mc.

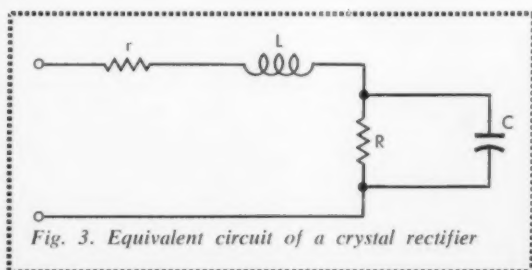


Fig. 3. Equivalent circuit of a crystal rectifier



Fig. 4. Inside of a type A mount showing the 50-ohm resistor



Fig. 5. Exterior appearance of type B crystal mount with tap

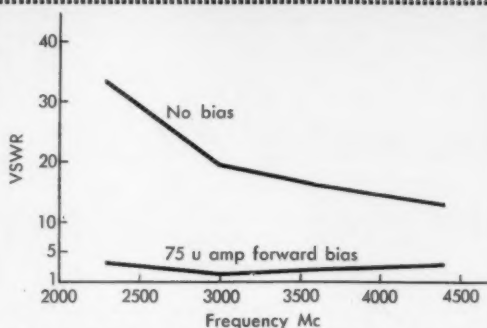


Fig. 6. Effect of bias on the VSWR of a type B crystal mount for nine type 1N23B crystals.

3. A 50-ohm resistor, Telewave Type RO63, is connected from the end of the centre conductor to the outer wall of the connector body. This resistor forms a shunt load in parallel with the higher resistance and reactance of the crystal resulting in a better match. The location of this resistor is shown in Fig. 4.

4. A low RF impedance termination is obtained at the top of the crystal cartridge with a bypass capacitor part of which is cylindrical and the rest a flat washer-like shape as shown in Fig. 1. The resulting capacity is about 35 pf measured at 200 Mc.

5. Video connection is made through the crystal cap and a modified BNC connector which is shown expanded in Fig. 2. The insulator is removed from the BNC connector and counterbored to allow free motion of the centre pin. A spring and contact button are attached to form a pressure contact on the crystal.

Type B crystal mount

The Type B crystal mount is also made by modifying a type N UG-21D/U connector as shown in Fig. 1:

1. The centre pin and teflon insulator are removed and a new pin made with a socket to fit the crystal tip.

2. An RF low-impedance termination is made at the top of the crystal with a bypass capacitor of the same design as that for the Type A mount. (Step 4 above.)

3. Teflon plugs are made to hold the centre pin in place and to form a space for the crystal, then the assembly is foamed in place, using Nopco Lockfoam Type P502. Two 0.062-in.-diameter holes are drilled in the body to allow for expansion of excess foam. Care must be taken to prevent foam from getting on the contact surfaces of the connector.

4. The same design of crystal cap is used on both the Type A and Type B mounts (Fig. 2).

Fig. 5 shows the exterior appearance of both mounts.

Measurements

All measurements were made using a forward bias current of 75 uamp through the crystal. Bias is used for three reasons:

1. to lower the RF input resistance of the crystal so that a lower VSWR is obtained. This shown in Fig. 6.

2. to lower the video resistance to about 700 ohms so that direct connection can be made to 50-ohm coaxial cable. The loss in output voltage caused by this mismatch can be regained with a step-up transformer at the amplifier input, or by direct connection to a transistor amplifier. Very little loss in sensitivity will occur as long as the crystal noise voltage is greater than the amplifier noise voltage at the amplifier input.

3. to decrease the differences in the sensitivities between crystals. For example, the spread of sensitivities of a sample of crystals was reduced from 79 db to 2.5 db

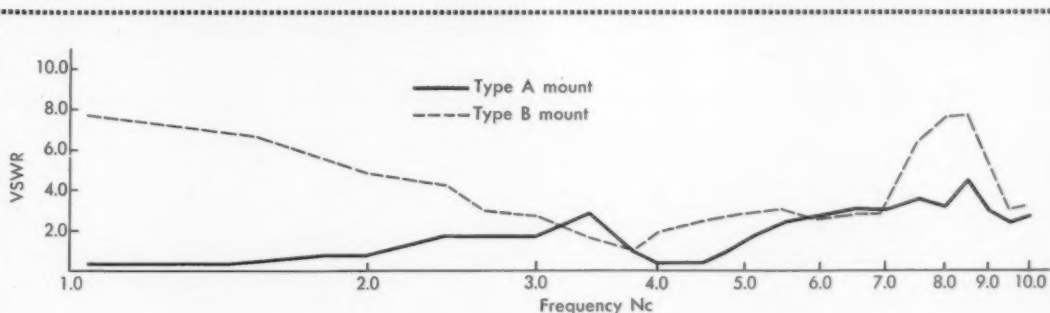


Fig. 7. Comparison of the input VSWR for the two crystal mounts showing spread of three 1N23B crystals

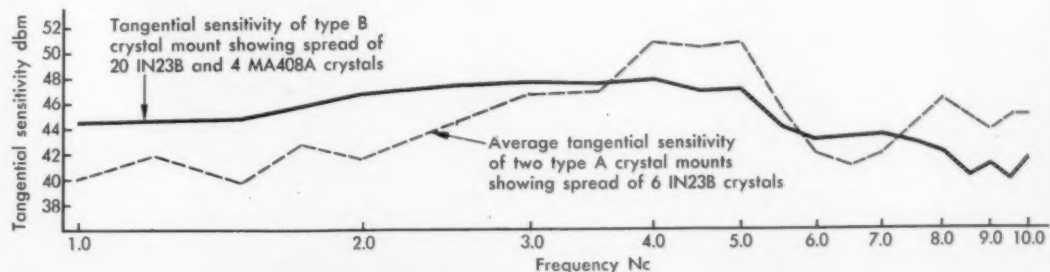


Fig. 8. Comparison of the tangential sensitivities of the two crystal mounts

crystal mount - cont.

by the application of 75 μ A bias and reduction of video load impedance from 10k to 50 ohms.

4. to improve the square law characteristics³.

Although the video amplifier bandwidth used on all measurements was about 600 kc, the maximum rise time of the output pulse from a crystal in its mount is less than 0.1 μ sec.

Performance

A comparison of the input VSWR's of the two mounts is shown in Fig. 7. The shunt resistance in the Type A mount improves the input VSWR over most of the band from 1.0 Nc to 10.0 Nc, although at a few frequencies between 3.2 to 7.0 Nc there is no significant difference. The variation in impedance match with 3 different crystals, indicated by vertical lines, is greatest where the VSWR is greatest.

The tangential sensitivities of the two mounts are given in Fig. 8.

In the lower curve, the average sensitivity of 24 crystals in Type B mounts is given.

The Type A and Type B mounts were then compared directly in a radiometer measurement over a frequency band from 1.0 to 10.0 Nc. Six type 1N23B crystals and two mounts of each type were used in the comparison test.

In the upper curve the average sensitivity of the Type A mounts, calculated from the results of the radiometer tests and the measured sensitivity of the Type B mounts is shown.

An examination of Fig. 8 will show that between 1 and 3 Nc the low VSWR of the Type A crystal mount is obtained at the expense of about 3db sensitivity. Each mount was connected to a 50-ohm source. From 3 to 10 Nc the VSWR of the Type A mount is generally lower and more uniform than that of the Type B mount, and has equal or better sensitivity.

Conclusions

A coaxial crystal mount with reasonably good performance over a wide band can be made from a Type N connector. The design of Type A mount produces a well matched crystal holder with a minimum loss in sensitivity. The Type B mount achieves a better sensitivity but is not as well matched to a 50-ohm transmission line.

When connected to a source not matched to 50 ohms the sensitivity of the Type B mount will vary with frequency depending on the distance and magnitude of the source mismatch. When Type A mount is connected to this same source the variations in sensitivity will be somewhat less.

END

Acknowledgements

The authors are indebted to A. E. Lindsay and J. D. Stewart for the construction of the crystal mounts and to A. K. Scrivens and R. W. Skrypnik who made the measurements.

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Regulator circuit improves operation of CdS sun-switch

S. A. GARDINER*

The term sun switch is used to describe a device which will switch a circuit when sunlight or daylight activates it. In this particular case, its function is to switch on a navigational aid light when darkness approaches and to switch it off after daybreak. By regulating the voltage on a cadmium sulphide sun switch, the operating point stays nearly constant despite deterioration of battery voltage.

Most of the navigational aid lights used on the Canadian inland waterways are now electrically operated. While this has resulted in a more reliable light, it has also presented problems related to the maintenance and replacement of batteries. When the lights were operated continuously, they had to be replaced a number of times each season, but with the advent of the cadmium sulphide cell and its use in sun switches, the frequency of replacement has been reduced considerably. Indeed, in many locations it is necessary to replace batteries only once each season.

When a new dry battery is installed, its initial terminal voltage is approximately 7.5 volts and this gradually decreases through use to about 4.5 volts when the unit is discarded. While this lower voltage is capable of providing a reasonable amount of light from the aid, it causes the cadmium sulphide cell, which is photo-resistive, to activate the light relay and turn the light on at a much earlier time in the evening than would be the case with a new battery. The turning-off time in the morning is affected to the same degree. (It should be noted that most sun switches of this type are connected to "fail safe", i.e., the controlled circuits employ the normally closed contacts on the relay. This ensures the functioning of the aid even though an open circuit should occur in the relay coil or the series photo-cell.) While this variation in time is relatively unimportant in isolated cases, it becomes a nuisance in a string or group of lights. It is impossible to maintain all of the batteries in a group of aids at the same voltage level because of different flashing characteristics, different candlepowers of bulbs, and occasional battery failure. Obviously, a higher voltage on the sun-switch will result in a later "turn-on" time for the light. Thus, it is common to have certain lights erroneously reported out-of-order, and time is wasted in checking these reports.

*National Research Council, Radio and Electrical Engineering Division, Ottawa.

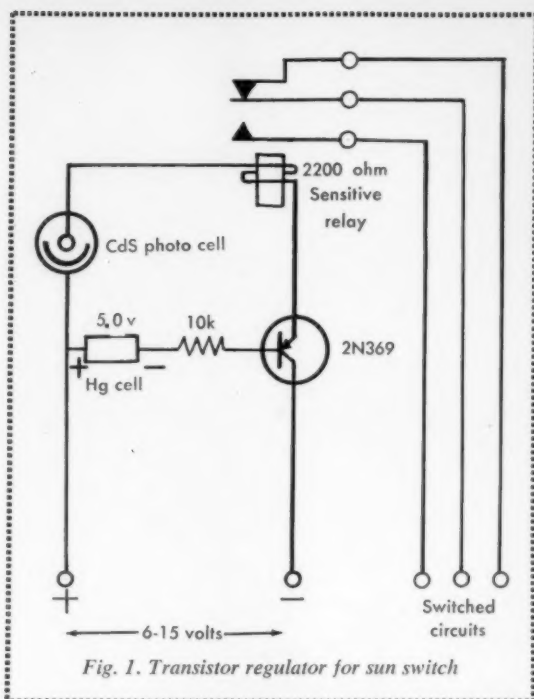


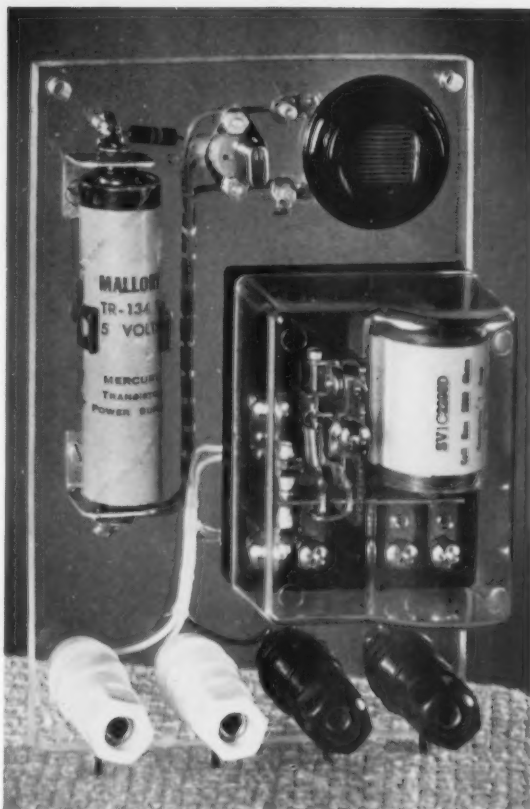
Fig. 1. Transistor regulator for sun switch

To alleviate this problem, a modified sun switch was constructed using a series-regulating element. First trials employed a Zener diode with fair results. However, the wastage of current through the diode made the use of this circuit impractical.

Attention was then turned to using a series transistor and a reference voltage as the regulator. As the circuit shows (Fig. 1) the transistor is in series with the relay coil and the photo-cell and has a mercury battery reference source connected to the base. The mercury battery was chosen because its voltage remains nearly constant during most of its useful life. Tests were conducted using both 4.0 volt and 5.4 volt reference batteries, although it was felt that the higher voltage would be preferable because it would give more positive relay operation in most sun switches. The results of these tests are given in tables 1 and 2. As may be expected, the base current in the transistor increases when the main battery voltage decreases to a value lower than the reference voltage. To limit this base current to a safe value, a 10k resistor was inserted between the mercury battery and the base of the 2N269 transistor. While this does affect the regulation slightly, it is a necessary precaution to protect the transistor when the main battery is disconnected for replacement. The deterioration in regulation amounts to a change in relay coil current of about 0.1 ma when the source voltage is varied between 6 and 22 volts. With no regulation in the circuit, the change in relay current is 1.7 ma, when the source voltage is varied from 3.0 to 7.5 volts (see table 1). This corresponds to a drastic change in light values to operate the sun switch (table 2). The difference in light values required to close and open the relay is due mainly to the differential inherent in the relay.

An added advantage of the stabilized sun switch is that it is usable, without change in circuit values, on either of the present 6 or 12 volt systems. This universal aspect is especially desirable from a production viewpoint because savings are generally realized in quantity purchases.

END



Packaging arrangement of the transistor regulator for the CdS sun switch used on navigational aid lights

Table 1. Comparative tests at light levels of approximately 300 foot candles.

Voltage of main battery	Unreg. relay ma	Regulated 4.0 v reference		Regulated 5.4 v reference	
		Relay ma	Ref. ua	Relay ma	Ref. ua
3.0	1.0	.95	96	.95	212
3.5	1.2	1.12	46	1.12	162
4.0	1.4	1.21	21	1.3	120
4.5	1.55	1.21	22	1.45	80
5.0	1.7	1.21	22	1.6	45
5.5	1.9	1.21	21	1.62	30
6.0	2.05	1.21	21	1.65	30
6.5	2.25	1.21	20	1.65	30
7.0	2.45	1.22	20	1.65	30
7.5	2.7	1.22	20	1.66	28

Table 2. Foot candles to operate sun switch.

Voltage of main battery	Unregulated		Regulated 4.0 v reference		Regulated 5.4 v reference	
	On	Off	On	Off	On	Off
3.5	10	58	11	66	11	63
4.0	8	40	8	46	8	45
4.5	7	32	8	46	7	35
5.0	6	26	8	46	6	28
5.5	5	21	8	46	5	25
6.0	4	18	8	46	5	24
6.5	3.5	15	8	46	5	24
7.0	3	13	8	46	5	24
7.5	2.5	11	8	46	5	24



The assembly area for Collins Canada is located in their new Toronto plant opened officially last month by The Hon. Raymond O'Hurley, Minister of Defence Production.



Each piece of equipment, such as this AN/ARC-552 UHF transceiver, is run continuously for twenty hours in the test area to ensure operation within specification.

Collins Radio Co. of Canada continues expansion with opening of new plant

IAN R. DUTTON, ASSOCIATE EDITOR

When Collins Radio Company of Canada Ltd. opened its new plant in Toronto last month it proved that a well-organized company, with good products, can thrive in Canada today.

Despite the general decline in military electronics business in Canada, this seven-year-old company has forged ahead to capture a major share of the market for communications equipment. And now it is diversifying its product line to strike a better balance between military and commercial customers.

The success of Collins Canada is largely due to the bold management concept of the parent organization, Collins Radio Company. As a wholly owned subsidiary, Collins Canada is treated as a full-fledged member of the corporate organization. The entire staff of 530 is Canadian and the company has full responsibility for development and production of certain product lines which can be — and are being — sold on world markets.

Within the corporate frame of reference, management at Collins Canada has complete authority and autonomy. This provides the incentive and flexibility necessary for success.

It was in September of 1953 that Collins Radio Company of Canada, Limited received its charter. Four months later a sales office was opened in Ottawa.

By the summer of 1955 the company started recruiting a production staff, and manufacturing began shortly afterward at a plant in Toronto.

Now, with the opening of a new plant a few blocks away from their original building, the company has a combined floor area of 85,000 square feet.

The company started its manufacturing operations with two major contracts — the AN/ARC-27 UHF transmitter-receiver for the RCAF, and the entire lateral communication scatter system for the Distant Early Warning (DEW) Line. The scatter contract is reputed to be the largest single contract placed with any Canadian electronics company supplying the DEW line.

Since then, Collins Canada has manufactured an extensive range of airborne and ground communications equipment. Perhaps the most publicized of these has been the AN/ARC-552 UHF transmitter-receiver. Originally designed in the United States, this equipment was evaluated and approved by the RCAF in 1957. However, there was a requirement to upgrade the equipment to meet more stringent temperature and vibration specifications. Collins Canada did that before starting manufacture of the equipment.

As production progressed, and with the help of the Department of Defence Production (DDP), Collins Can-



A new commercial product developed by engineers at Collins Canada is the 32MS-1A mobile or fixed station radio. Shown in this picture is the control box.



A Collins development, Kineplex, transmits data over telephone lines from this room in the new Toronto plant to a Corporation data centre at Cedar Rapids, Iowa.

JOHN L. PLANT is vice-president and general manager of Collins Radio Co. of Canada. Mr. Plant was born in Swansea, Wales in 1910 and received primary education in Britain before coming to Canada. After graduation from the University of British Columbia in engineering, he joined the RCAF in 1931. His career includes command of a flying boat squadron in Ceylon, and command of RCAF stations in England during World War II. After the war he held several important positions including Chief of Staff to the Commander-in-Chief at Allied Headquarters in Europe and Air Member for Technical Services at AFHQ, Ottawa. In 1955 he was appointed Air Officer Commanding, AMC, Rockcliffe, Ont. He held the rank of Air Vice Marshall at the time of his retirement from the RCAF. In August, 1956, Mr. Plant joined Collins Canada as executive vice-president. He then joined Avro Aircraft Ltd. and became president and general manager. Last year he returned to Collins.



ada achieved almost 95% Canadian component content in the AN/ARC-552.

This same equipment has contributed to the gradual build-up of engineering facilities in the Toronto plant. Twenty thousand square feet of the original building are now devoted to engineering, research and development. Total engineering staff at the present time numbers 92.

With its engineering team, Collins Canada has been able to design new equipment such as the AN/ARC-504 UHF emergency transceiver. The RCAF has adopted it for the CF-104. Other North Atlantic Treaty Organization countries have shown interest in it, and may adopt it for use with their F-104G aircraft.

Collins Canada has already been successful in selling its equipment to other countries. It has supplied a trans-horizon scatter system to the Orinoco Mining Co. to maintain voice communication between Puerto Ordaz and Caracas, Venezuela.

The company also announced recently (CEE, June, page 5) that it has received a series of contracts to supply AN/ARC-552A transmitter-receivers for F-104G aircraft being built for NATO countries. The contracts total almost \$3 million for the UHF equipment.

Last month the company disclosed the sale by tender of nine complete single sideband radio systems to the

Emergency Measures Organization of the Ontario Department of Commerce and Development for a province-wide communication network. It would be used in disasters and as part of emergency measures communication.

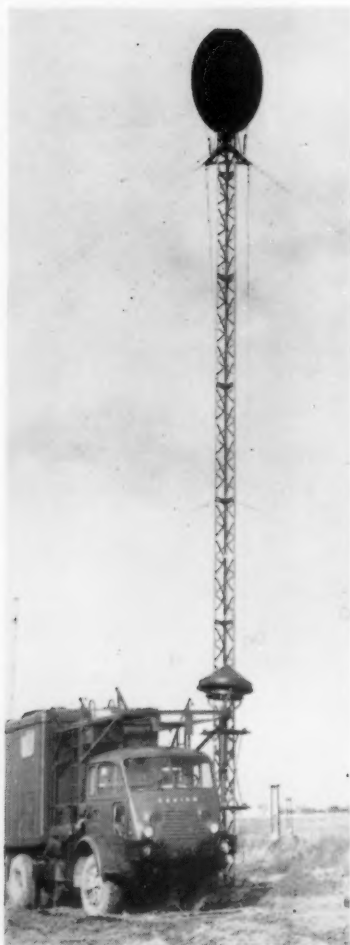
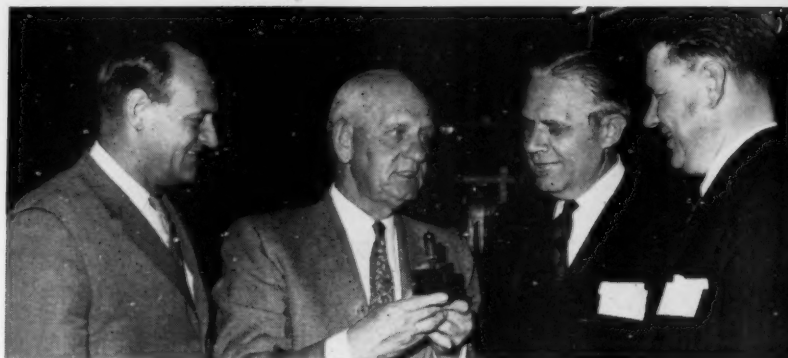
To gain more sales among commercial customers, Collins Canada is diversifying its product line. The company has been successful in selling communications equipment to Trans-Canada Airlines and Canadian Pacific Airlines. Now it is intensifying its efforts to sell equipment to telephone operating companies, mining firms and others requiring radio equipment.

Most recent addition to the commercial line is a new mobile SSB transceiver, the 32MS-1A. Offering a choice of either SSB or conventional AM operation on any of four preset channels in the 1.6 to 15.0-Mc range, it has peak envelope power of 100 watts and may be used in either mobile or fixed station applications. The equipment was designed at Collin's Toronto plant.

A commercial sales office has been opened at 909 15th St. S.W., Calgary (AM 3-1409). It is under the supervision of J. A. Murray and will serve commercial customers from Winnipeg to the West Coast.

With this type of corporate structure, local autonomy, diversification of products, and aggressive export selling, Collins Canada may soon outgrow its new facilities. **END**

What's new in view



This line-of-sight microwave equipment produced by Canadian Westinghouse Co., Electronics Division, Hamilton, is shown in field trials near Paris, France. The communications system was shipped to France last year for duty with Supreme Headquarters Allied Powers in Europe.

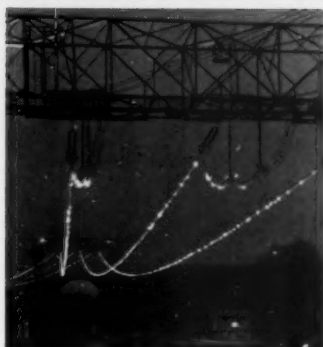
Canadian General Electric's Radio Valve Co. celebrated a major milestone last month when it produced its 125,000,000th electronic tube. To mark the event, W. E. (Davy) Davison, recently retired president of Radio Valve, was presented the tube. With him above are R. M. Robinson (left), vice-president of the Electronic Equipment and Tube Dept. of CGE, Dr. J. Herbert Smith, president of CGE, and R. Story, vice-president of Radio Valve and manager of CGE's tube section. It was in 1921 that Davy Davison came to Canada from General Electric to establish tube manufacturing in the vacuum tube division of CGE, later reorganized as Radio Valve. During World War 2, production of cathode ray tubes was started. This led to production of TV picture tubes which were exported to the U. S. before Canada had TV. Now, Radio Valve produces 12,500,000 receiving, and 500,000 picture tubes annually in its two plants located within metropolitan Toronto.

When the Society of Motion Picture and Television Engineers held its 89th semiannual convention in Toronto earlier this year, there was a great deal of attention directed towards new developments in 8mm film. The introduction of magnetic recording has made it possible to record sound economically, and with high quality, on 8mm movie film. A variety of new sound equipment has started to appear on the market, and more can be expected. Electronics came under discussion in other fields at the convention. A number of papers dealt with the subject of control equipment for high-speed photography, instrumentation, control consoles and intercom equipment for TV studios, sound and video recording on magnetic tape. SMPTE executives shown below, (l to r) are: R. H. Ray, executive vice-president; J. W. Servies, president; H. Teitelbaum, convention vice-president; N. L. Simmons, past president; G. G. Graham, local arrangements chairman.





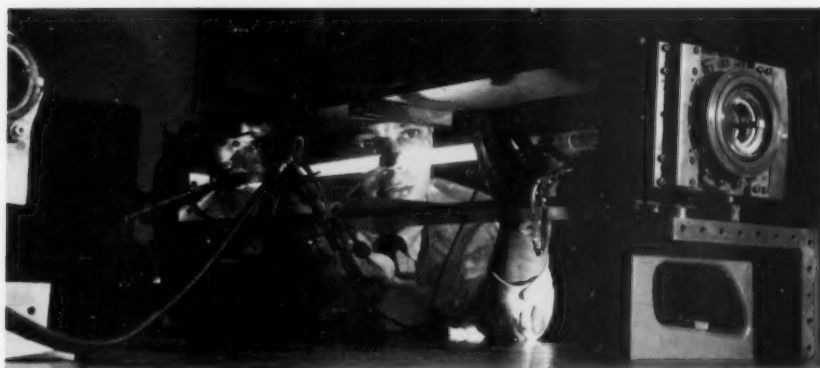
Captain Bligh never had it so "good". This latest version of HMS Bounty, built last year at Lunenburg, N.S. for the new MGM movie, "Mutiny on the Bounty," is equipped with radar, direction finder, depth recorder, radio telephone, communications receivers and transmitters — all supplied and installed by RCA Victor Co. Ltd.



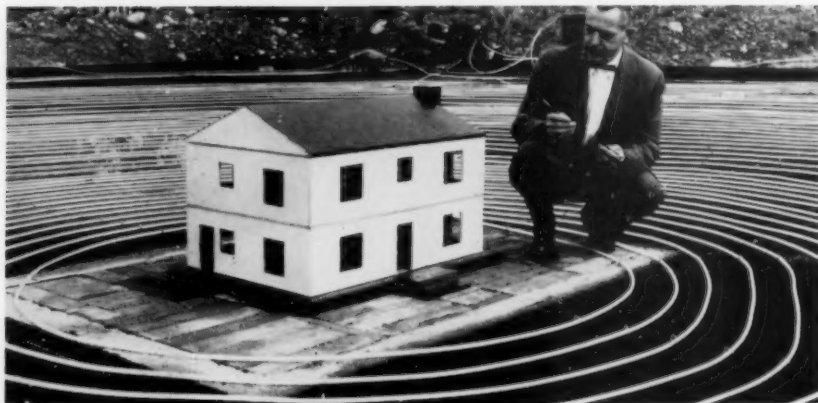
Conductors, arranged for transmission of 460,000 volts are aglow with corona because they are being energized at approximately 750,000 volts. Conductors in upper right corner are free of corona because they have been arranged in groups of four. Experiments are being carried out near Pittsfield, Mass. by General Electric Co.



Eerie appearance of Sperry Gyroscope technician results from masked microscope used to assemble new precise inertial guidance system in a dust-exhaust hood. New gyro is claimed to be so accurate that, if employed on a mission to the moon, it could guide a space vehicle to within one mile of the predicted site.



Dr. A. Javan, proposer of Bell Telephone Laboratories' optical gas maser, inspects heart of unit, a 40-in. tube filled with helium and neon. Interactions between gas atoms produce coherent beam of infrared light that may one day be used to carry vast numbers of telephone conversations, data and television programs.



Dr. Eric T. Clarke, Technical Operations, Inc. explains equipment used to test radioactive fallout protection within an average house. In the test, a cobalt source of 10-curie strength travels in concentric circles through a mile of polyethylene tubing simulating radiation as it would be generated from radioactive fallout. Protection offered by rooms is checked on dosimeters. Work is sponsored by U. S. Office of Civil and Defense Mobilization.

Patent news

Scientists in government agencies such as the National Research Council and the Defence Research Board frequently invent circuits or devices having commercial application. In such cases, patents are taken out and made available to industry. Persons interested in obtaining licenses should contact Canadian Patents and Developments Ltd., 100 Sussex St., Ottawa 2, Ont.

Magnetic core memory

Case No. 2805

Inventor: R. S. C. Cobbold

This invention was made by Dr. Cobbold while working at the Defence Research Telecommunications Establishment, Ottawa, as part of the development of the DRTE Solid State Digital Computer. Memories of this type are in use in the DRTE computer in Ottawa and in the Data Reduction Facility at the joint DRB/MIT Lincoln Laboratory, Radar Research Laboratories at Prince Albert, Saskatchewan.

The invention was described in the U. S. publication "Electronic Equipment Engineering," Vol. 8, No. 2, Feb. 1960, Page 61, in the paper "Novel magnetic core memory system," by R. S. C. Cobbold. Considerable additional information is available on the design of the transistor drive circuits, read-out circuits, etc.

Patents on this invention have been applied for in the U.S.A., Canada and the U.K.

This invention describes a magnetic core memory with parallel read-in and read-out. Its advantages over previous magnetic core memories are that it is easier to build and maintain, while it eliminates the induction of spurious read-out signals.

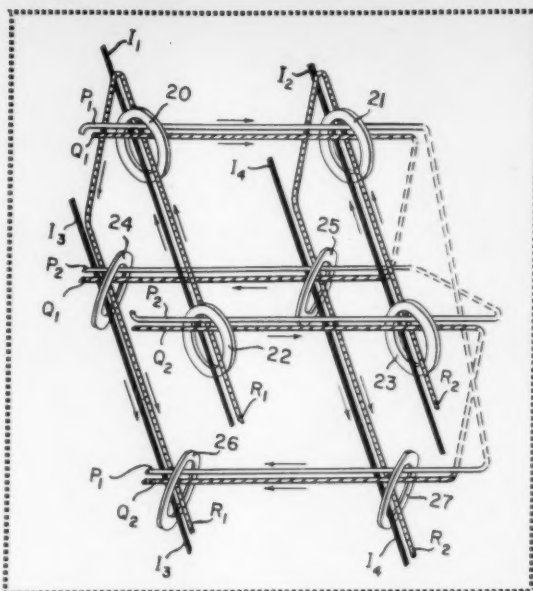
Magnetic core memories are used to store binary information by making use of the fact that a core of ferromagnetic material can exist in either of two stable magnetic states. These may represent the binary "one" and "zero," and thus each core can store one "bit" of information. Switching between states is accomplished by linking a core with an electric current of sufficient magnitude.

Most conventional memory systems consist of a stack of planes, the cores in each plane being arranged in rows and columns. The word capacity is equal to the number of cores in a plane, and the word length is specified by the number of planes. Each core is threaded by two perpendicular coincident current drive wires (X and Y), each of which carries half of the total current required to drive a core to saturation in a given direction. A single read-out wire is threaded at 45 degrees to the drive wires.

It has been found that memories of this type are difficult to construct since the read-out wire must be threaded by hand, usually one core at a time. Furthermore, it is very difficult to locate the read-out wire so that there is complete cancellation of the inductive pick-up from the two drive wires, thus spurious read-out signals may occur.

The conventional memory may be modified so that the read-out wire runs parallel to, say, the X drive wire. This system is suitable for automatic wiring, but it has a serious disadvantage. To avoid masking the read-out signals with inductive pick-up, the X drive current must be switched on sufficiently before the Y current to allow the switching transients to decay. This type of memory, therefore, has a long cycle time.

The difficulties of the memories described are overcome by this invention, which provides a system in which



the read-out wire is perpendicular to both drive wires. The figure shows a very small memory of this type with a capacity of 4 two-digit words. Both capacity and word-length can, of course, be much greater.

It should be noted that in this system a word is stored in a row of cores in one plane. The four words in the memory shown in the figure are stored in core-pairs 20-21, 22-23, 24-25 and 26-27. Each core is threaded by two parallel drive wires which form part of the windings P_1 , P_2 , Q_1 and Q_2 . Read-out winding R_1 is threaded through the left-hand cores of both planes, and R_2 is threaded through the right-hand cores. There is thus a read-out winding for each core along a row in each plane threaded by a pair of drive windings.

If currents are passed through the P_1 and Q_1 windings, cores 20 and 21 are sampled and outputs are generated simultaneously in both R_1 and R_2 . Thus the two-bit word in cores 20 and 21 is read-out in parallel. The inhibit windings I_1 , I_2 , I_3 and I_4 , which are alongside the read-out windings, are used in a similar way to write information into the memory in parallel.

A number of memory units of this type have been constructed and used, including a 1024-word, 40-digit type. It has been found that they have the following advantages over previous memories:

There is no read-out noise due to inductive coupling with the drive wires. The design of read-out amplifiers may therefore be simplified.

There is no 45-degree read-out wire. The memory planes can therefore be produced automatically.

Fewer soldered joints are necessary to connect the planes to each other. By wiring pairs of planes together back-to-back, the number of joints needed for 32 planes of 16×32 cores is less than 1,200, as compared with at least 3072 joints using previous construction.

Defective cores are easily removed and replaced, and wiring errors in construction are easily corrected.

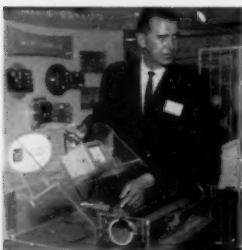
A disadvantage of the system is that there is a 50% increase in the inductance of the X drive wire. It is still possible, however, to use transistor drive circuitry for medium sized memories of this type.

END

Controls and instrumentation



One of the instruments given close inspection at the ISA show was this Honeywell ElectroniK 17 circular chart recorder.



E. Bragg of Black, Sivalls & Bryson was kept busy demonstrating the Penetron thickness gauge. It uses gamma radiation.

Toronto's Mayor Nathan Phillips opened the ISA show last month under the watchful eye of ISA president R. H. Tripp.



ISA meeting in Toronto set high standard at technical sessions

Automation and the use of computers for production control can be expected to increase significantly in the next few years as Canada's productive capacity grows.

Some of the business and technical trends of this type were aired at the Instrument Society of America summer instrument-automation conference held in Toronto last month.

In three sessions aimed at management, speakers attempted to analyze the impact of instrumentation and control upon business.

Automation has become the "whipping boy" for many individuals and groups, particularly at times when unemployment exists in a community. However, as several speakers pointed out, automation has been with us in one form or another for many years and has ultimately created more jobs than it has destroyed.

We can expect to see increasing use made of automatic processes in Canadian industry. The growth of automation and of the industry will be interdependent.

There has been a steady increase in the use of computer control in several industrial processes. Continuous flow processes, in particular, can offer operating economies through improved yield and reduced wastage when computer control is applied. However, the technology is still in its early stages

and has a long and interesting road ahead of it.

One area just opening up for instrumentation is adaptive control systems, where the control equipment can start with a given set of operating parameters and improve upon them as it gains experience in its function.

The design of such equipment is one of the most interesting challenges for instrumentation engineers today.

ISA contracts three shows for New York

The Instrument Society of America has contracted the New York Coliseum for three future exhibits, it was announced here. The 17th International Instrument-Automation Conference & Exhibit will be held in New York City in 1962 in conjunction with the Society's annual meeting. The dates have been set for the period October 15-19. In 1964, the ISA New York Exhibit is scheduled for October 12-16 and in 1966 it will be held from October 10-14.

The Society first occupied the New York Coliseum in 1956 for its 11th International Exhibit, and again in September, 1960, for its 15th International Conference & Exhibit.

Plans are being made to hold the ISA Conference & Exhibit and annual meeting in Chicago in the fall of 1963, and in Los Angeles in the fall of 1965.

IBM enters field of industrial control

International Business Machines Co. Ltd. has announced plans to market in Canada the new 1710 Control System.

The system consists of a digital computer and a data converter which can be used to interpret sample data in the processing and manufacturing industries. The system calculates and compares this data against the optimum found in the stored program of the computer. It then computes adjustments which are required to bring the total process into optimum balance. Instructions for the operator are printed out. It also indicates adverse trends and alarm conditions.



IRE Canadian Conference plans nearing completion

Plans for the 1961 IRE Canadian Electronics Conference are well under way with selection of technical papers completed, and sales of booth space approaching the 90% mark.

Fred J. Heath, chairman of the executive committee, forecasts a successful meeting with a well-balanced technical program, and many new engineering developments on display.

A. R. Low, chairman of the technical program committee has announced that selection of papers for the 20 technical sessions was completed at the end of June.

"The quality of the papers submitted this year is very high," said Mr. Low. "Selecting the papers for the program was a real challenge for the committee. The number of papers

submitted was slightly higher than in previous years. The wider choice available to the committee permitted it to select a well-balanced program. The majority of rejections resulted from papers being isolated without suitable companion papers to form a session," said Mr. Low.

In addition to the 20 technical sessions there will be two panel sessions; one on education and the other on management.

Exhibit space has been rented by more than 130 companies, representing almost 90% of the available area. Conference officials anticipate a complete sell-out this year. A list of exhibitors, as of the middle of June, is given below. Full information about the conference will be given in CEE, September.

These companies will display their products — will yours?

EXHIBITOR	BOOTH		
Abbey Electronics Ltd., Downsview, Ont.	142	A. Dreskin Sales Corp., Montreal.	269
The Ahearn & Soper Co. Ltd., Toronto	230, 327	E.M.I.-Cossor Electronics Ltd., Halifax	266
Alpha Aracon Radio Co. Ltd., Downsview, Ont.	136	Edwards High Vacuum (Canada) Ltd., Burlington, Ont. ..	538
American Electrical Heater Co., Detroit	558	Eitel-McCullough, Inc., San Carlos, Calif.	158
The American Superior Electric Co. Ltd., Toronto	369	Electro Sonic Supply Co. Ltd., Toronto	536
Ampex of Canada Ltd., Rexdale and Ottawa, Ont.	152	Electrodesign Ltd., Montreal	135
Andrew Antenna Corp. Ltd., Whitby, Ont.	156	Electronic Marketing Co. of Canada Ltd., Montreal	W-22
Astral Electric Co. Ltd., Toronto	461	Electronics and Communications, Toronto (Age Publications Ltd.)	435
Atlas Instrument Corp. Ltd., Toronto	342, 344, 350	Erie Resistor of Canada Ltd., Trenton, Ont.	433
Atlas Polar Co. Ltd., Toronto	E-24	Esna Canada Ltd., Toronto	E-20
Atlas Radio Corp. Ltd., Toronto	342, 344, 350	Ferranti-Packard Electric Ltd., Toronto	259
Automatic Electric Sales (Canada) Ltd., Toronto	563	Ferritronics Ltd., Willowdale, Ont.	443
Aviation Electric Ltd., Montreal	251	Len Finkler Ltd., Toronto	562
Bach-Simpson Ltd., London	130, 229	General Instrument — F. W. Sickles of Canada Ltd., Waterloo, Ont.	459
Barnard Stamp & Stencil Ltd., Hamilton	235	General Radio Company, Toronto	252
Bausch & Lomb Optical Co. Ltd., Toronto	141	The Glendon Instrument Co. Ltd., Scarborough, Ont.	469
Bayly Engineering Ltd., Ajax, Ont.	247, 249	Hackbusch Electronics Co. Ltd., Toronto	129
Beatty Bros. Ltd., Fergus, Ont.	465	Hammond Mfg. Co. Ltd., Guelph, Ont.	441
Belden Mfg. Co., Chicago	236	Helipot Div. of Beckman Instruments Inc., Toronto	243
Bishop Sons & Co. Ltd., Toronto	335	John Herring & Co. Ltd., Toronto	164
Boston Insulated Wire & Cable Co. Ltd., Hamilton	543	Hickock Electrical Instrument Co., Cleveland	239
Brian Engineering Ltd., Montreal	137	Honeywell Controls Ltd., Toronto	351
Brown Boveri (Canada) Ltd., Montreal	535	M. J. Howard & Co. Ltd., Ottawa	E-4
Burgess Micro Switch Co. Ltd., Toronto	363	Hysol (Canada) Ltd., Toronto	253
Burndy Canada Ltd., Toronto	460	The Institute of Radio Engineers, New York	166
CTS of Canada Ltd., Streetsville, Ont.	370	Instronics Ltd., Stittsville, Ont.	553
Canadian Applied Research Ltd., Toronto	543	International Business Machines Co., Don Mills, Ont. ..	242
Canadian Electronics Engineering, Toronto (Maclean-Hunter Publishing Co. Ltd.)	366	Jerrold-Electronics (Canada) Ltd., Toronto	342, 344, 350
Canadian General Electric Co. Ltd., Toronto	352	George Kelk Ltd., Don Mills, Ont.	364
Canadian Marconi Co., Montreal and Toronto	145	Kester Solder Co. of Canada Ltd., Brantford, Ont.	545
Canadian Motorola Electronics Ltd., Toronto	143	Lake Engineering Co. Ltd., Scarborough, Ont.	432-438
Canadian Patents & Developments Ltd., Ottawa	355	Leesona Corp., Providence, R.I.	552
Canadian Westinghouse Co. Ltd., Hamilton	450	Leland Electric Co. Ltd., Guelph, Ont.	466
Canadian Wilber B. Driver Co. Ltd., Toronto	567	Lenkurt Electric Co. of Canada Ltd., Vancouver	559
Cannon Electric (Canada) Ltd., Toronto	452	Licon Div. of Canada Illinois Tools, Don Mills, Ont. ..	E-6
Capitol Radio Engineering Inst., Washington, D.C.	163	Litton Industries, Beverly Hills, Calif.	430
Centralab Canada Ltd., Ajax, Ont.	541	E. G. Lomas, Ottawa	533
Cerl-Dale Ltd., Toronto	332	McCurdy Radio Industries Ltd., Toronto	245
C. P. Clare Canada Ltd., Toronto	238	Measurements, A McGraw-Edison Div., Boonton, N.J. ..	456
Collins Radio Co. of Canada Ltd., Toronto	551	Millivac Instruments, Inc., Schenectady, N.Y.	564
The Constanta Co. of Canada Ltd., Montreal	E-22	Muirhead Instruments Ltd., Stratford, Ont.	138
Allan Crawford Associates, Willowdale, Ont.	167		
Cyanamid of Canada Ltd., Montreal	455		
Daystrom Ltd., Cooksville, Ont.	528		
Digital Equipment Corp., Maynard, Mass.	161		
Douglas Randall (Canada) Ltd., Scarborough, Ont. ..	442-446		

National Fibre Co. of Canada Ltd., Toronto	338	A. C. Simmonds & Sons Ltd., Downsview, Ont.	139
National Research Council, Ottawa	241	Sinclair Radio Labs. Ltd., Downsview, Ont.	139
Northern Electric Co. Ltd., Montreal	E-14	Sola Basic Products Ltd., Toronto	E-8
Northern Industrial Prods. Ltd., Don Mills, Ont.	159	Stark Electronic Sales Co., Ajax, Ont.	237
PIC Design Corp., East Rockaway, L.I., N.Y.	244	Strippit Tool & Machine Ltd., Brampton, Ont.	337
Philips Electronics Industries Ltd., Toronto		Syntron (Canada) Ltd., Stoney Creek, Ont.	331
Tubes, Semiconductors and Components Div. ...	146, 150	TMC (Canada) Ltd., Ottawa	361
Telecommunications & Electronic Equip. Div.	549	Tektronix, Inc., Willowdale, Ont.	160
Polytronics Co., Toronto	431	Telegraph Condenser Co. (Canada) Ltd., Toronto	131
Potter & Brumfield, Div. of AMF Canada Ltd., Guelph ..	555	Texas Instruments Inc., Rexdale, Ont.	W-24
Premier Metal Housings Ltd., Montreal	264	John R. Tilton Ltd., Toronto	132
Prentice-Hall Inc., Englewood Cliffs, N.J.	345	F. V. Topping Electronics Ltd., Toronto	257
RCA Victor Co. Ltd., Montreal	349	Transitron Electronic Corp., Toronto	134
R-O-R Associates Ltd., Don Mills, Ont.	258, 359	Universal Instruments Corp., Binghamton, N.Y.	E-10
Radionics Ltd., Montreal	451	Vacuum Electronics Corp., Plainview, L.I., N.Y. ...	453A
Raytheon Canada Ltd., Waterloo, Ont.	261	Ward Leonard of Canada Ltd., Toronto	547
Renfrew Electric Co. Ltd., Toronto	358	White Radio Ltd., Hamilton	232-236
Rogan Bros. Inc., Skokie, Ill.	W-6	Wholesale Radio & Electronics Ltd., Toronto	449
Rohn Mfg. Co., Peoria, Ill.	336	Willer Engineering & Sales Co., Toronto	260
Rutherford Agencies, St. Laurent, Que.	232	The Wind Turbine Co. of Canada Ltd., Waterloo ...	W-14
E. J. Sharpe Instr. of Canada Ltd., Willowdale, Ont.	571	Yokogawa Electric Works Inc., New York, N.Y.	235
D. T. Shaw Co., Montreal	341		
Sigma Instr. Inc., South Braintree, Mass.	341		

Reports—continued

an investment. The electronics firm can develop, supply and maintain the precision devices Spartan needs in its survey business. It can also provide employment for Spartan's 35-man staff of pilots and technicians for the nine months of the year during which they cannot operate in Canada's northland.

Says Delta president Syd Wellum: "This move is actually a two-way expansion. We're making a move into the type of electronic design and maintenance that Spartan needs. But it will also give us a chance to get even deeper into research and development." The company is planning a broad sales advance into the U.S. market based on its transistorized broadband amplifier and other products. Projected 1961 sales will total \$500,000.

Tele-Radio Systems acquires stock of Western Communications Ltd.

Tele-Radio Systems Limited, Toronto, has acquired all the outstanding stock of Western Communications Limited, Vancouver, B.C., and will operate the company as its wholly owned subsidiary, according to the announcement by Ivor H. Nixon, president. Mr. Nixon becomes president of Western Communications Limited; Murray E. Laidlaw is named vice-president and general manager, and Paul A. Vatcher is elected secretary-treasurer.

The Vancouver firm will not only continue its activities in the marine radiotelephone field but will, as well,

be the Western Canada office of Tele-Radio Systems, thus providing better liaison and service to customers of the latter firm. Coincidental with the new ownership, Western Communications Limited occupies premises with improved facilities at 1518 West 3rd Avenue, Vancouver 9, B.C. Telephone RE 1-1321.

Canadian-made auto radios penetrate U.S. market.

RCA Victor Co. Ltd., Montreal, has obtained an initial \$250,000 order for 5,000 AT-105 car radios from Charles Kreiser, Inc., New York auto accessories distributor. The unit was designed and developed by RCA Victor's consumer products engineering group.

Sales potential of at least \$1 million annually is forecast for 1962, with the contract expected to exceed \$3 million a year eventually.

The Montreal firm has also announced that it is now manufacturing loudspeakers for its 1962 line of consumer products at its Renfrew, Ont. plant. Tuners, yokes, flybacks and other transformers are also produced at the Renfrew plant, while tubes and cabinets are made at other company plants in Montreal and Owen Sound, Ont.

CGE buys Canada's largest mobile radio service company

Canadian General Electric Co. has purchased the Edmonton firm, Cowley Electronics Services Ltd., as part of a nation-wide program to expand its service facilities in the mobile radio and general communications field.

Cowley Electronics has facilities for

the servicing and maintenance of two-way radio and other communications equipment, and presently operates over most of central and northern Alberta, and in northern British Columbia.

No name-change is contemplated, and R. K. Cowley will continue as president of the service company.

New principals and representatives

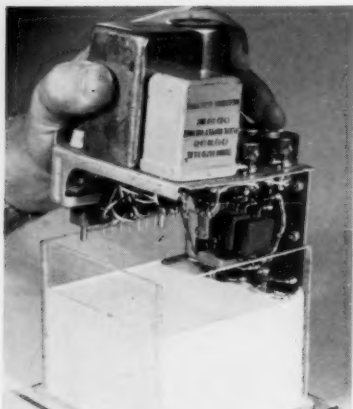
Controlling stock interest of Microsonics, Inc., Hingham, Mass., manufacturers of ultrasonic delay lines, has been purchased by Sangamo Electric Co., Springfield, Ill. Sangamo is represented in eastern Canada by David R. Beattie, Toronto, and by D. Eldon McLennan of Vancouver in the western provinces.

North Hills Electronics, Inc., Glen Cove, L.I., N.Y., has appointed Whitaker Electronics Ltd., Ottawa and Toronto, as their Canadian representatives (constant current power supplies, wideband transformers, adjustable toroids and coils).

Conway Electronic Enterprises Ltd., Toronto, is now exclusive Canadian agent for Westmore, Inc., Fanwood, N.J. (test equipment, power supplies, computer systems). Conway has also been appointed as Canadian representative for Millivac Instruments, Inc., Schenectady, N.Y.

Centralab Canada Ltd., Ajax, Ont., has assumed responsibility for sales through parts distributors throughout Canada of the complete line of resistor products manufactured by Welwyn Canada Ltd., London, Ont. This includes deposited carbon types and the newer metal oxide types.

New components

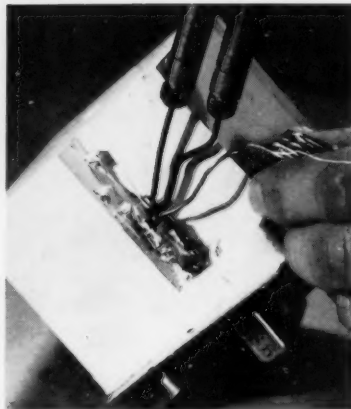


Silicone rubber 101

Silastic RTV 601 silicone rubber can be completely cured at room temperatures within 24 hours in sections of unlimited thickness. The thickness of the



cross-section, or the degree of confinement of the mass of this new liquid rubber has no effect on either the uniformity of the cure or the rate of set-up. As shown in the photographs, the new



silastic RTV 601 may be cut away from encapsulated components for repair, then new rubber poured to reseal the equipment.

Dow Corning Silicones Ltd., Toronto.

Miniature molded oxide resistors 102

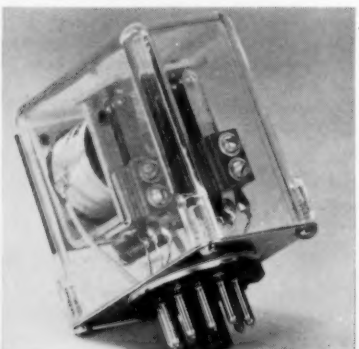
Type F20 miniature molded, 1/2-watt, oxide resistors were originally designed for equipment employing large quantities of transistors, such as computers, where extreme reliability is important. The F20 is sold either as a 5% selection tolerance resistor or with a guaranteed total excursion of 5, 7 or 10%.

Welwyn Canada Ltd., London, Ont.

General purpose relay 103

Type FG multiple contact relays are designed for general purpose applications. They are mounted in clear or colored rectangular plastic enclosures. A wide range of contact combinations is available with wiping contact action for self cleaning. They are designed to operate from half wave rectified ac, or from standard ac or dc supplies.

Osborne Electric Co. Ltd., Toronto.



Triggered spark gaps 104

Two new spark gaps have been developed for use in electronic crowbar applications and for high energy switching functions by Edgerton, Germeshausen & Grier, Inc. Model GP-11 has minimum electrode to electrode cutoff voltage of 1.8 kv, maximum holdoff of 3.5 kv, and trigger pulse voltage of 7.5 kv. Peak currents over 1100 amperes can be handled. Model GP-14 has minimum cutoff voltage of 12 kv, maximum holdoff of 40 kv, and minimum trigger pulse voltage of 10 kv. Peak current is more than 10,000 amperes.

Samuel C. Hooker (Canada) Ltd., Montreal.

Power amplifier tetrode 105

Amperex type 7609 forced air cooled, external anode tetrode has been designed for use as an RF power amplifier at frequencies up to 500 Mc. It will withstand sweep frequency vibrations of 10 G at 25. to 2,000 cps, and severe shock tests. In all other respects it is identical to the type 4X150D and is the preferred replacement type. The 7609 has a plate dissipation of 250 watts. Maximum plate voltage is 2,000 volts up to 150 Mc; plate current is 250 ma. The cathode is the unipotential type operating at 26.5 volts.

Philips Electronics Industries Ltd., Toronto.

Trimmer potentiometer 106

Series C140PC is a low cost, compact trimmer potentiometer with 25 turn lead

screw and clutch stops designed for commercial printed circuit board applications. Resistance element performance equals or exceeds MIL-R-94B characteristic Y and provides infinite resolution. Power rating is 0.2 watt at 70 deg. C with maximum operation up to 125 C and resistance range 500 ohms through 1 megohm (linear taper).

CTS of Canada Ltd., Streetsville, Ont.

Transducers 107

Types AMV and VMV transducers for current and voltage quantities respectively give millivolt outputs without the addition of output resistors. A wide range of outputs is available depending on customer requirements. The unit is packaged in a standard Westinghouse type VR case. All components are static and provision has been made for limiting output voltage on over-voltage, open circuited C.T.'s, and under fault conditions. Filtered outputs are available at a slight extra cost.

Canadian Westinghouse Co. Ltd., Hamilton.

Telemetry system 108

This all-electronic telemetry system cycles in 2 seconds or less. It features a photo-diode detector which scans input position in relation to a cam etched on glass and operates sealed dry switch contacts in the transmission system. In operation, the position input from a measuring element is converted at the transmitter to a switch closure, the duration of which is proportional to the measurement. The transmitter switch closes the circuit through a transmission link to the

receiver, energizing the receiver for an equal period of time. The receiver converts the time period into a record or indication of measurement.

The Foxboro Co. Ltd., Montreal.

Decade counter tube 109

Type Z302C cold cathode, gas-filled decade counter tube provides an output pulse of such magnitude that the usual interstage coupling amplifier is not needed. Indication is by an orange-red glow discharge which is viewed through the dome of the tube envelope at the end of the electrodes. The tube is designed for use in scalars and industrial counters. It is free from photoelectric effects with the ignition characteristics remaining constant during daylight and darkness.

Other tubes in the same family are the Z303C bi-directional decade counter and the type Z502S bi-directional decade selector tube. All three types operate at speeds up to 4 kc.

Philips Electronics Industries Ltd., Toronto.

Epoxy coated glass insulation 110

Irvington epoxy coated glass No. 2525 is a combination of a high temperature resin coating and an inorganic woven glass fabric. Thermal stability and dielectric characteristics of this material qualify it as a reliable insulation for the broad range of Class A through Class F.

Minnesota Mining and Manufacturing of Canada Ltd., London, Ont.

Power line filters 111

The design of McMillan Industrial Corp. power line filters provides low

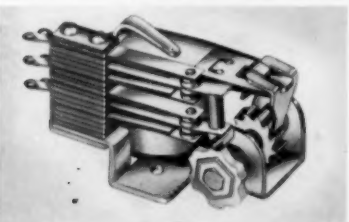


reactive current, light weight, low voltage drop, and no leakage. The filter illustrated, type A-25, is rated 20 amperes, 0-400 cps, 250 vac. Attenuation is 100 db from 70 to 45,000 Mc. Other filters provide attenuations of 100 db down to 0.014 Mc.

David R. Beattie, Toronto.

Impulse relay 112

Guardian series 670 impulse relay is designed for operation in excess of one



million steps. Each momentary impulse (up to 10 steps per second) causes the relay to reverse its cam actuated contacts. Contact arrangements up to dpdt with ratings to 1,500 watts non-inductive, or up to 20 amperes locked motor current, motor load control on 115 volts, 60 cps. Coil voltages to 230 vac or 110 vdc. Applications include on/off control of lights, motors, appliances and speakers.

A. C. Simmonds & Sons Ltd., Toronto.

Miniature solenoids 113

Miniature solenoids, designed to meet all requirements of MIL-S-4040C, are available in diameters of 1/4 in. and up, for voltages of 6, 12, 24, 36, 116 and 230 vdc. They have been developed for application in digital computers, printers, punched tape block readers and similar electromechanical equipment.

Cannon Electric Canada Ltd., Toronto.

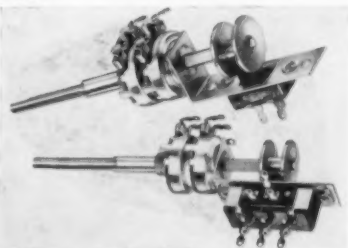
Instrument lamps 114

Two new instrument and indicator lamps, types GE158 and GE159 have all-glass wedge bases. They can withstand high ambient temperatures, operate in push-pull sockets which, combined with the lamp, are smaller, lighter in weight and less expensive than metal base miniature lamps.

Canadian General Electric Co. Ltd., Lamp Dept., Toronto.

Slide switch variable resistors 115

Ingenuous switching arrangements are possible with a new series of slide switch variable resistors. Primary application is expected in radio, TV and phonograph equipment. They are available in ratings up to 6 amps, 125 vac on the switch contacts, and 1/2 watt, 200 ohms to 10 megohms for the variable composition resistors. Switches are available in positive or spring return styles, spst to 4pdt. In addition, switch ratings of 1/2, 1 and 3 amp ratings can be supplied.



Centralab Canada Ltd., Ajax, Ont.

Size 5 servomotor 116

Size 5 servomotor has been designed for applications calling for minimum size and weight. Designated model 9005-1502-0, the servomotor is only 0.865 inches long; weight is 0.6 oz. Powered by 26-volt, 400 cps reference voltage, the servomotor has a no-load speed of 10,000 rpm. Torque at stall is 0.1 oz.

in., while rotor inertia is 0.18 gm.cm².

Helipot Div. of Beckman Instruments, Inc., Toronto.

Power relay 117

PM series heavy duty power relays provide 4 pdt operation and measure 3-11/32 in. long, 2-41/64 in. wide and 2-1/2 in. high. Contacts are rated at 16 amps, 115 vac; 8 amps at 220 vac; 1 hp per movable arm at 115 or 220 vac. Standard coil operating voltages are 6 to 230 vac, 50/60 cps. The relay is designed to meet Underwriters' Laboratories spacing and creepage requirements to 300 volts for motor controllers of 1 hp or less.

Potter & Brumfield, Guelph, Ont.

Switching tube 118

Switching at relatively low control voltage levels, with an efficiency of 95 per cent, is achieved with the new Litton L-3408 Switch tube. High voltage hold-off and high current handling capability are the prime attributes of this new tube, designed and constructed for high voltage, high switch rate, floating deck modulator applications. Maximum collector voltage is 150 kv; peak collector current is 20 amps; maximum collector power is 10 kw.

Lake Engineering Co. Ltd., Scarborough, Ont.

Broadband antennas 119

This new line of broadband antennas can be used for such applications as



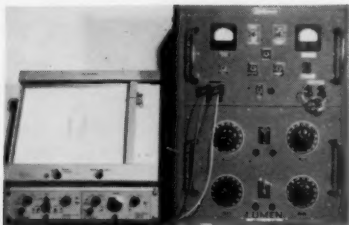
transmitting antennas for antenna pattern ranges, satellite tracking, and electronic countermeasures. Vertical, horizontal, left-circular, and right-circular polarizations can be provided in bandwidths of 10 to 1 or greater. Models now available are 12E1-10 which covers the frequency range of 100 to 1,000 mc with a gain of 8 ± 1 db and a maximum VSWR of 2.0 to 1; and model 13E1-5 (illustrated) which covers the range from 1,000 to 5,000 mc with a gain of 7 ± 1 db and a maximum VSWR of 2.2 to 1.

Also available is a master control which, when used with these antennas, provides a single installation covering 100 to 5,000 mc.

Litton Systems (Canada) Ltd., To-

To obtain further information
about these products, use the
reader service card on page 57

New instruments



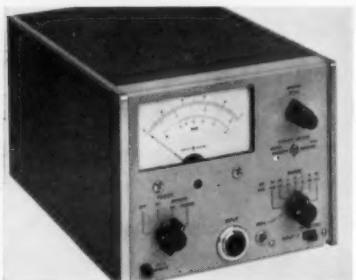
B-H loop tracer 120

Ferrotracer automatically traces dynamic B-H curves. When used with an X-Y recorder, a permanent record of the magnetic material under test can be made in less than 60 seconds. In production testing, a set of pre-determined go/no-go limits may be formulated on the graph paper. The hysteresis loop is then superimposed on the paper to check whether or not it conforms to the tolerances previously set. Core matching may also be effected in the same manner by comparing each core to a given set of standards.

Lumen, Inc., Joliet, Ill.

Power meter 121

Hewlett-Packard power meter type 431A provides accuracy and temperature stability for power measurements from 1 microwatt to 10 milliwatts. Its



drift stability of less than 2 microwatts per degree Centigrade eliminates continual zero setting. In addition, only one zero adjustment is needed to calibrate for all ranges. Because of its temperature stability, the meter achieves an additional sensitivity of 10 db over previous equipment. Full scale readings of 10 microwatts are covered in 7 ranges. The meter face is also calibrated in dbm with 5 db between ranges.

Atlas Instruments Corp., Ltd., Toronto.

Digital voltmeter 122

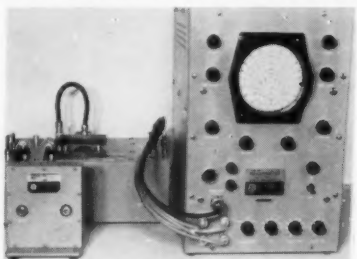
Solartron dc digital voltmeter LM 902.2 presents voltages from 100 uv to 1.500 kv as a 4-digit display in decimal form with polarity discrimination. Display is by means of optical projection and red or black backgrounds signify positive and negative inputs respectively. Input impedance is 10 megohms except

on the two lower ranges, which have impedances of 1 megohm and 100 k. The long term accuracy is $\pm 0.1\%$ of maximum reading on each range. Two additional voltage ranges of 100 v to 1 kv have input impedances of 100 megohm and a measuring accuracy of $\pm 0.5\%$. Read-out time is constant at 280 milliseconds irrespective of the voltage input, which may be floated up to 700 volts with respect to ground.

Instronics Ltd., Stittsville, Ont.

Impedance plotter 123

Alford Manufacturing type 14 automatic impedance plotter has extended



ranges over previous models. At the low end, an additional range of 0.1 to 2.5 Mc facilitates measurement of crystal-transducer impedances as well as other measurements in sonic and ultrasonic investigations. At the high end, an additional range of 1,100 to 1,700 Mc increases the over-all utility of the equipment. Over-all frequency coverage is 0.1 to 1,700 Mc. Used in conjunction with a suitable external oscillator, the type 14 provides continuous impedance information, displayed as a trace on the Smith-chart-calibrated CRT of the presentation unit.

Electrodesign, Montreal.

In-circuit transistor tester 124

Hickok transistor tester utilizes a test method which neutralizes circuit impedance before tests are made, which permits in-circuit measurement of ac beta with an accuracy of $\pm 5\%$. Utilizing an ac bridge principle with the transistor input elements as one arm of the bridge, the total impedance is nulled. The tester will measure the following in-circuit parameters: ac beta, Ic, transis-



tor input resistance and base-emitter circuit impedance. It will also measure ac beta, Ic and Icbo out of circuit.

Stark Electronic Sales Co., Ajax, Ont.

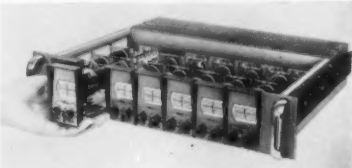
Frequency meter 125

Telemechanics direct reading frequency meter model TD1 is capable of producing and measuring any discrete frequency between 1000 cps and 3000 Mc. Stability, depending on the crystal chosen, is 2 parts in 10^8 to 4 parts in 10^{10} . The instrument has an output capable of driving, and facilities are provided for plugging in an external counter. Internal impedance is 75 ohms; output voltage on fundamental frequencies is 100 millivolts; input voltage on fundamental and harmonic frequencies is 1 millivolt; spurious frequency level is -80 db.

Conway Electronic Enterprises Ltd., Toronto.

Monitor oscilloscope bay 126

Model 260 oscilloscope bay, introduced by EI Labs, provides seven 2-in. transistorized monitor oscilloscopes in a standard $3\frac{1}{2} \times 19$ -in. rack mount. Each plug-in oscilloscope module has independent sweep and vertical circuits. Frequency response is dc to 1 Mc within 3 db; vertical sensitivity is 0.5 v to 5 v rms per inch of deflection; input impedance is 1 megohm and 20 pf; sweep frequency is from 10 cps to 100 kc.



Electromechanical Products, Agincourt, Ont.

Thermocouple compensator system 127

Gulton Industries has introduced a 9-channel thermocouple compensator system accurate to within 6 degrees over an operating range of 32 F to 165 F. The complete system is composed of 9 zone boxes, one zone box adaptor module (containing 9 channel isolated power supplies) and 9 bridge circuit cards assembled into the module Model EM-T-101. Each channel is interchangeable with any other using a resistance thermometer as one leg of a bridge circuit. The bridge circuit produces an emf equal and opposite to the emf generated in the zone box owing to ambient temperature change at the junctions in the zone box. This emf provides the temperature compensation.

Titania Electric Corp. of Canada Ltd., Gananoque, Ont.

New equipment

Outdoor telephone set 128

The No. 1436EN telephone set is a rugged, weatherproof magneto telephone for outdoor service such as at mines and logging camps. It consists of a wired assembly mounted in a black enamelled cast aluminum housing. The set has two main compartments, one holding the handset, the other holding the two dry cells and circuit components. As furnished, the set is wired for use with loaded underground distribution wire, short cable loops, short loops of open iron wire, and open copper wire lines consisting of short lengths of cable and open wire. Other arrangements are easily coped with.

Northern Electric Co. Ltd., Montreal.

Economy two-way radio 129

Following the recent announcement from the Department of Transport that it was relaxing its requirements to permit more general mobile radio licensing, the compact, economy Pacer 15-watt, two-way radio has been introduced. Measuring 4 1/4 in. high, 7 3/4 in. wide and 12 1/2 in. long, the radio is self-contained. Battery drain is 4.2 amperes in the "on" position, and the transistorized power supply can be operated from negative or positive ground 12-volt systems. A range of optional equipment is available to provide versatility for special requirements.

Canadian General Electric Co. Ltd., Electronic Equipment & Tube Dept., Toronto.

Power supplies 130

Three new Kepco power supply units have been introduced, delivering 0-36 volts at up to 15 amps. Features include transistor regulation, continuously variable voltage output, remote error sensing for regulation at load, and built-in overload protection controlled by both load and temperature. Load regulation is 3 millivolts maximum or 0.1% whichever is greater, with a stability of 6 millivolts or 0.1% over an 8 hour period after 1 hour warm-up. Ripple is less than 1 millivolt rms; temperature coefficient is less than 0.05% per deg. C; recovery time is 50 usec.

Ward Leonard of Canada Ltd., Toronto.

Magnetic thin film memory planes 131

Thin film memory planes are now available on the market. First in the line is type BIP-1000 which can store 20 words of 8 bits each or 160 bits of information. The units have cycle time capabilities of 0.2 usec. Other configurations will be made available as determined by customer requirements.

Burroughs Business Machines Ltd., Toronto.

Video recorder 132

Model VR-8000 is a non-broadcast video tape recorder designed for closed circuit television operations. It employs a single video record/reproduce head and utilizes a helical scanning system. The 7 1/2 ips tape speed allows the recording of 2 hours of program material on a 12 1/2 in. standard reel. Up to three tracks of audio information can be recorded in addition to the video. Tapes recorded on any VR-8000 are interchangeable with tapes recorded on any other VR-8000. Frequency response is flat to 5 Mc; down less than 6db at 6 Mc.

Ampex of Canada Ltd., Rexdale, Ont.

HP communication receiver 133

HF communication receiver model 51S-1 provides continuous coverage of the 2-30 Mc range in 1-Mc bands with 1-kc increments on the main tuning dial. Additional coverage from 0.2-2.0 Mc permits broadcast monitoring or laboratory use. Reception of upper sideband, lower sideband, AM or CW signals is provided at any frequency within the tuning range. AGC characteristics and a separate product detector contribute to optimum SSB performance. A rejection notch tuning feature provides at least 40 db attenuation of unwanted signals. A level meter may be switched to indicate either RF signal or audio output levels.

Collins Radio Co. of Canada Ltd., Toronto.

Coaxial switches 134

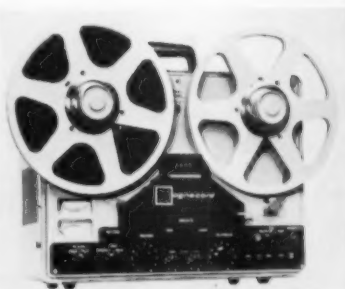
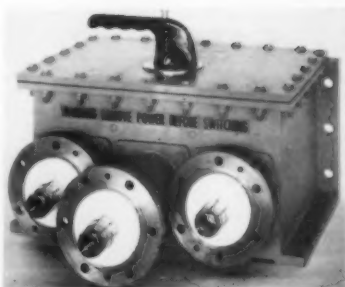
Series 8000 high power coaxial switches incorporate a new electro-mechanical switching arrangement which reduces contact wear. A direct bearing mechanism is used to achieve reliable operation. The spdt switches are being made in both 1 1/2 and 3 1/2 in. coax. Isolation is in excess of 75 db over broad frequency ranges in the VHF and UHF bands.

Bogart Manufacturing Corp., Brooklyn, N.Y.

Audio recorder 135

Magnecord 748 series tape recorder/reproducer has 3 3/4 and 7 1/2 ips tape speeds and is built to meet professional performance standards. It is capable of stereophonic, monophonic and sound-on-sound recording and accommodates up to 10 1/2 in. reels. Either 1/2 or 1/4 track heads can be ordered. A direct drive hysteresis synchronous motor provides timing accuracy of ± 3 seconds in 30 minutes of playing. At 7 1/2 ips, frequency response is 40 to 15,000 cps, ± 2 db; flutter and wow are held to 0.15%.

Midwestern Instruments, Inc., Tulsa, Oklahoma.



New handbooks reveal extent of transistor technology

Within the past few weeks a number of new books and manuals have been issued by manufacturers of semiconductor products. They offer a wealth of information, at nominal cost, on basic theory, characteristics and application of semiconductors.

This is a roundup of news about some of the recent books issued.

GE Tunnel Diode Manual

This first edition contains information on the theory of tunnel diodes, and description of how they work in a variety of circuits applications. Because of the new field of technology, this book contains more theory and design information, than it does specifications of tunnel diodes. The 96-page book is available from Canadian General Electric distributors at \$1.25.

GE Transistor Manual

This new fifth edition contains 339 pages of detailed characteristics and specifications of GE transistors, along with characteristics tables of all makes of transistors. New chapters have been added dealing with tunnel diodes, test circuits and a variety of new circuits. Copies may be obtained from Canadian General Electric distributors at \$1.25.

International Rectifier Solar Cell and Photocell Handbook

This 100-page handbook contains over 75 practical light-operated circuits, projects and demonstrations of both selenium photocells and silicon solar cells. Included are chapters on basic photovoltaic theory, nomenclature, radiation theory, photocell performance characteristics, power supplies, photometers, relays, photoelectric camera control, and infrared and ultraviolet photocell applications. Copies are available from electronic distributors or Douglas Randall (Canada) Ltd., 126 Manville Rd., Scarborough, Ont. Price is \$2.00.

International Rectifier Zener Diode Handbook

This new handbook on zener diodes contains basic theory, characteristics and application data of use to design engineers. The theoretical discussion is coupled with practical considerations and illustrated application data on the use of these new semiconductor voltage regulating devices. The book describes application of silicon zener diodes for use in audio, RF, instrumentation and computer circuits. Copies are available from electronic distributors or Douglas Randall (Canada) Ltd., 126 Manville Rd., Scarborough, Ont. Price is \$2.00.

Motorola Silicon Zener Diode and Rectifier Handbook

This 185-page second edition covers

basic theory, design characteristics and applications of zener diodes and rectifiers, and is intended to serve as a guide in the use of these new devices. Chapter headings include: Characteristics of silicon zener diodes; Comparisons of gaseous tubes and zener diodes; Regulated power supplies; Surge protection; AC and DC amplifiers; Temperature compensation and impedance cancellation; New approaches in zener diode applications; The diffused-junction silicon rectifier. Copies may be obtained from Canadian Motorola Electronics Co., Semiconductor Prods. Div., 105 Bartley Dr., Toronto 16. Price is \$2.00.

Motorola Power Transistor Handbook

This 200-page handbook is devoted entirely to power transistor theory, design and application. It is intended to serve as an accurate guide in the use of the versatile power transistor. The book contains more than 200 drawings and charts, plus numerous design problems and solutions. It serves as a reference as well as an introduction to the subject. Mechanical, electrical and thermal characteristics, plus maximum ratings and characteristics are covered. Copies may be obtained from Canadian Motorola Electronics Co., Semiconductor Prods. Div., 105 Bartley Dr., Toronto 16. Price is \$2.00.

Philco Transistor Guide for Communications Circuit Designers

This guide presents a comprehensive summary of the basic ground rules to be followed in designing transistorized communications circuits. Rules of thumb are given to provide circuit designers with a practical understanding of the results that can be expected from transistorized communications equipment. Introductory paragraphs are devoted to an elucidation of the various parameters which specify and categorize the characteristics of communications transistors. Copies may be obtained free of charge by circling number 150 on the reader service card in this issue.

Mullard Reference Manual of Transistor Circuits

This manual of over 300 pages contains useful circuit diagrams, practical information and principles of operation involving transistors. It is intended to provide information to people who have some interest in electronics, but who may not have an engineering education. The first nine chapters provide a background with the main emphasis on small signals and audio frequencies. Subsequent chapters cover the treatment of large signals and high frequencies. Copies may be obtained from Philips Electronics Industries distributors. Price is \$1.95.

Transistors for AM/FM Receivers and AF Amplifiers

This publication deals with the principles of transistor circuitry for radio receivers and audio amplifiers. Typical circuits are included to provide information for circuit development. The book also contains a complete survey giving up-to-date information on the current types of transistors for radio receivers and audio amplifiers. It is available from Philips Electronics Industries distributors. Price is \$2.95.

Using Transistors

This book from the Philips Technical Library provides a simplified summing up of facts about transistors and their circuits. It also gives a sound background on electronic theory and shows exactly how the junction transistor works. It then describes circuits with transistors as amplifying elements. In the last chapter are discussed some simple examples which the amateur experimenter can build without difficulty. Copies may be obtained from Wm. Dawson Subscription Services Ltd., 587 Mt. Pleasant Rd., Toronto. Price is approximately \$2.50.

International Transistor Substitution Guidebook

This Rider publication is a compilation of direct transistor substitutions. International in coverage, it lists over 4,500 direct substitutions — American, Japanese, British, French, German, Dutch and Italian transistor types — embracing both triodes and tetrodes. Case styles and dimensions are given, as well as electrical characteristics. Copies may be obtained from Charles W. Pointon, Ltd., 66 Racine Rd., Rexdale, Ont. Price is \$1.50.

Howard W. Sams Transistor Substitution Handbook

This book lists over 6,500 direct transistor substitutions, including a separate section which shows 668 suitable replacements for Japanese transistors. Also included is a separate directory of semiconductor diodes and rectifiers with recommended substitutions. Accompanying text sections explain why transistor substitution is possible, when it is appropriate, how to choose substitutes, precautions to observe when substituting, etc. Copies may be obtained from electronic distributors or A. C. Simmonds & Sons Ltd., 100 Merton St., Toronto 7. Price is \$1.65.

Tunnel Diode Circuit Design Handbook

This 16-page handbook prepared by Transatron Electronic Corp. on circuit design of the tunnel diode contains sections on the theory of tunneling action; various general circuit considerations; simple switching circuits (OR gate, AND gate, MAJORITY gate, and Fan-Out considerations); and four common digital circuits including shift register, ring counter, binary counter and memory circuit. Copies of booklet AN-1359A are available free of charge by circling number 151 on the reader service card in this issue.

(Continued on page 53)

NEW

WIDE-VUE

panel instruments

Simpson



3 1/2"



4 1/2"



2 1/2"

a new concept

in styling and visibility

The clean, graceful lines of these "Wide-Vue" panel instruments add two plus values to your equipment. First, style—ultramodern beauty that blends with the advanced design of today's panels. Second, functionalism—longer scales together with wide-angle readability. The 2 1/2" size, for example, has the same scale length as a conventional 3 1/2" panel instrument. The durable, plastic cover is formed in one piece, and can be supplied with black or color finishes. External magnet type movement or self shielded core magnet meter movement.



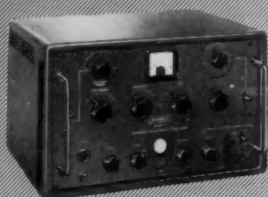
1255 BRYDGES ST.

LONDON, ONT.

IN U.S.A.: SIMPSON ELECTRIC COMPANY, 5200 W. KINZIE ST., CHICAGO 44, ILL.

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Accurate and Stable



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D - 880 - A (2 phase)

Frequency: 0.01 c/s to 11.2 kc/s.
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People—continued

K. J. MacDonald has been appointed assistant chief of sales and traffic services for Canadian National Telecommunications.

Born in Port Arthur, Kelly MacDonald graduated from the University of Toronto in 1947 with a BASC degree in electrical engineering. The following year he joined CNT, being assigned to various engineering positions.

In 1951 he was promoted to plant engineer and in 1957 was made assistant general radio engineer, the position he held at the time of his present appointment. In his new post, Mr. MacDonald is responsible for the development and planning of traffic handling, methods and equipment utilization, and the preparation of operating practices.



MacDonald



Hudon

Honeywell Controls Ltd. has added **Peter J. Hudon** to the staff of its precision components division in Montreal.

Mr. Hudon will be responsible for the sale of Micro switches, meters and semi-conductor products in Montreal and surrounding area.

Edward J. Frazer is now associated with **Hoyle, Niblock and Associates, Consulting Radio Engineers and Attorneys, North Vancouver.**

Mr. Frazer graduated from the University of British Columbia with the degree of BASC in electrical engineering in 1958. During his undergraduate years he was employed by the Canadian Broadcasting Corp. Following graduation he was engaged on radio and microwave systems engineering for the British Columbia Telephone Company. Mr. Frazer is a member of the Association of Professional Engineers of B.C., and a Member of IRE.

El-Met-Parts Limited has appointed two employees to senior positions.

C. A. (Charlie) Scott has been appointed vice-president of the company. R. A. (Bob) Briggs has been appointed general manager. Mr. Briggs will retain the duties of sales manager.

509/3ca

Ottawa report—cont.

munications system using satellites.

Besides development work Canadian participation in the international program will include provision of satellite tracking stations.

Canadian companies may soon be reaching for a bigger share of U.S. Defence Department contracts. This could result from a recent increase in our Defence Production Department's appropriation for "establishment of production capacity."

These appropriations are used to help Canadian firms absorb pre-production costs and improve their competitive position when bidding against American firms which have already written off such expenses.

Supplementary estimates tabled June 8 increase the 1961-62 appropriation of \$1,750,000 from \$1,250,000 in 1960-61.

The Defence Production Department matches dollar-for-dollar the manufacturer's pre-production costs to a limit of 10% of the contract price. This means the department's share is never more than 5% of the total.

An appropriation of \$1,750,000 could be used for this purpose in contracts with a total value of up to \$45 million. Canadian firms in 1960-61 secured more than \$30 million in U.S. contracts.

The Commons in double-quick time has debated and passed a bill to revamp the National Industrial Design Council. The bill will shortly go through the Senate and become law.

Its purpose is to put the council on a more formal and permanent basis and to open the way for closer co-operation by the council and Design Centre with business, especially manufacturers.

Trade Minister Hees explained the reason for moving the council from the National Gallery to his department and added:

"With the present state of competition in markets both at home and abroad, Canadian industry cannot afford to ignore design as a basic competitive factor. Canada's competitors are fully aware of this."

"Basic design thinking, from choice of raw materials to the method of production, the actual product design and the manner of packaging, can result in a better product in terms of cost to the producer and in terms of function and appearance to the purchaser. This is an enormous field and full co-operation among manufacturers, distributors, consumers and government is needed if we are to achieve the desired results."

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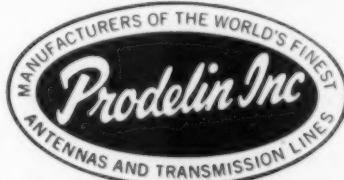
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electronics



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Defence contracts

Unclassified electronics contracts for \$10,000 or more have been awarded to the following Canadian firms by the Department of Defence Production. A figure in parentheses indicates the number of contracts, the amount being the total value.

April 16-30, 1961

- ▶ Aircraft Appliances & Equipment Ltd., Rexdale, Ont., repair and overhaul of aircraft accessories, aeronautical instruments, electrical equipment, special investigations and technical studies, \$353,600 (2).
- ▶ Aviation Electric Ltd., Montreal, repair and overhaul of aircraft instruments and accessories, electrical materiel, special investigations and technical studies, \$3,597,276 (3).
- ▶ Bristol Aero-Industries Ltd., Winnipeg, technical publications, \$10,182.
- ▶ Campbell Mfg. Co. Ltd., Willowdale, Ont., cable assemblies, \$10,892.
- ▶ Canadian Applied Research Ltd., Toronto, repair and overhaul of aeronautical instruments, electrical and air armament equipment, \$94,700.
- ▶ Canadian Aviation Electronics Ltd., Montreal, mobile calibration teams, \$142,671 (2); maintenance spares for radar trainers, \$15,000.
- ▶ Canadian General Electric Co. Ltd., Toronto, third line maintenance of radars, \$104,000.
- ▶ Canadian Marconi Co., Montreal, navigation equipment, \$125,000.
- ▶ Canadian Westinghouse Co. Ltd., Ottawa, repair and overhaul of electrical/electronic equipment, \$20,000 (2).
- ▶ Carriere & MacFeeters Ltd., Scarborough, Ont., repair and overhaul of aeronautical instruments, electrical equipment, special investigations and technical studies, \$31,850.
- ▶ Computing Devices of Canada Ltd., Ottawa, engineering services, \$133,544; rental of navigators and navigator track plotters, \$49,320.
- ▶ Croven Ltd., Whitby, Ont., radio crystals, \$12,728.
- ▶ E.M.I.-Cossor Electronics Ltd., Dartmouth, repair and overhaul of electrical/electronic equipment, \$69,750 (2).
- ▶ Electronic Materials International Ltd., Ottawa, repair and overhaul of electrical/electronic equipment, \$75,370.
- ▶ Garrett Mfg. Ltd., Rexdale, Ont., repair and overhaul of electrical/electronic equipment, \$72,291.
- ▶ Honeywell Controls Ltd., Toronto, repair and overhaul of aircraft instruments and accessories, \$452,000.
- ▶ ITT Electronics Service Co. of Canada Ltd., Town of Mount Royal, Que., supply and installation of integrated control and excitation console, \$25,439.
- ▶ International Business Machines Co. Ltd., Ottawa, rental of office machines, \$239,131 (3); technical representative, \$21,624.
- ▶ Radionics Ltd., Montreal, maintenance spares for radiacmeter, \$17,908.
- ▶ Renfrew Electric Co. Ltd., Renfrew, Ont., harness components for wireless set, \$165,000.

▶ Sperry Gyroscope Ottawa Ltd., Ottawa, repair and overhaul of aircraft instruments and accessories, electrical materiel, special investigations and technical studies, \$393,622 (2).

May 1-15, 1961

- ▶ Ahearn & Soper Co. Ltd., Ottawa, tubes, \$13,104.
- ▶ Bayly Engineering Ltd., Ottawa, wattmeters, \$16,517.
- ▶ Bell Telephone Co. of Canada, Montreal, technical representative, \$16,553.
- ▶ Bell Telephone Co. of Canada, Ottawa, rental of telephone, teletype and data facilities, \$1,834,812 (4).
- ▶ British Columbia Telephone Co., Vancouver, rental of telephone and teletype facilities, \$47,000 (2); lease of communication circuits, \$2,230,131 (7).
- ▶ Canadian Arsenals Ltd., Ottawa, industrial assistance to provide for the improvement of electronic equipment, \$275,000.
- ▶ Canadian Aviation Electronics Ltd., Winnipeg, rental of radio facilities, \$12,963; third line maintenance of radar and ancillary equipment, \$40,000.
- ▶ Canadian Aviation Electronics Ltd., Montreal, technical representatives, \$73,163; technical publications, \$172,054.
- ▶ Canadian General Electric Co. Ltd., Toronto, third line maintenance of radars, \$226,000; maintenance of electronic equipment, \$60,000; radar equipment spares, \$21,025; refurbishing of electronic equipment, \$10,000; electronic equipment, \$56,209.
- ▶ Canadian Motorola Electronics Co., Toronto, radar equipment support spares, \$15,216.
- ▶ Canadian National Railway Co., Ottawa, rental of telephone, teletype and data facilities, \$994,374 (4).
- ▶ Canadian Pacific Railway Co., Ottawa, rental of telephone, teletype and data facilities, \$606,000 (3).
- ▶ Computing Devices of Canada Ltd., Ottawa, aircraft instrument test equipment, \$84,245; weather and terrain mapping radar equipment, \$82,513.
- ▶ E. P. Electric Products Co. Ltd., Montreal, generator sets, \$158,860.
- ▶ Garrett Mfg. Ltd., Rexdale, Ont., cabin temperature control testers, \$70,754; electrical equipment, \$16,348.
- ▶ International Business Machines Co. Ltd., Ottawa, rental of office equipment, \$152,701 (2); maintenance of data processing equipment, \$23,043.
- ▶ George Kelk Ltd., Don Mills, Ont., aircraft maintenance equipment, \$81,319.
- ▶ Leland Electric Co. Ltd., Guelph, Ont., inverters, \$46,886.
- ▶ Litton Systems (Canada) Ltd., Rexdale, Ont., controls for radio sets, \$28,683; repair and overhaul of electrical/electronic equipment, \$21,530.
- ▶ R. H. Nichols Ltd., Downsview, Ont., wireless testing installation kits, \$227,406.
- ▶ Northern Electric Co. Ltd., Ottawa, third line maintenance of radar and ancillary equipment, \$495,130 (2); communication equipment, \$13,457.
- ▶ RCA Victor Co. Ltd., Montreal, maintenance of microwave and associated electronic equipment, \$195,000.
- ▶ Remington Rand Ltd., Ottawa, rental of office equipment, \$12,426.

For further information mark No. 26

▶ C. R. Snelgrove Co. Ltd., Don Mills, Ont., radio crystals, \$27,272.
 ▶ Sperry Gyroscope Co. of Canada Ltd., Montreal, remote magnetic compensators, \$19,150; repair and overhaul of tools and test equipment for radars, \$47,848; technical representatives, \$10,000.
 ▶ T.M.C. (Canada) Ltd., Ottawa, transmitter spares, \$24,556.
 ▶ Telegraph Condenser Co. (Canada) Ltd., Toronto, capacitors, \$24,081; research contract, \$59,975.

CAMESA News

This bulletin has been prepared for CEE by the Approvals and Specifications Divisions, Canadian Military Electronics Standards Agency, Ottawa.

▶ A test method for measuring current noise in fixed resistors has been developed. This test method is proposed for inclusion, as a standard test procedure, in MIL-STD-202. It is not intended that this test will be used as a general test requirement for all military type fixed resistors, but will be applied when the application requires resistors with specified noise characteristics.

The test method utilizes a specially designed instrument which measures both system noise and total noise. The total noise includes the noise produced by current flow in the resistor; therefore, by subtracting the system noise from the total noise, the current noise is provided. The voltage produced in the instrument by the current noise has a logarithmic function which is expressed in decibels. By the use of ancillary equipment the noise may also be presented in a visual or audio manner.

The noise test instrument is designed to test resistors with values from 100 ohms to 22 megohms, and to measure current noise voltages from 0.6 microvolts to 1,000 microvolts per decade. Further information is available from CAMESA on request.

▶ A report has been compiled on the various methods used for the measurement of temperature coefficients of capacitors. An outline of the method to be used by CAMESA laboratories is given with an analysis of the accuracy to be expected. At present the method is limited to measurements at 1 Mc but it can easily be extended to cover measurements at 100 Kc by substituting for the capacitance bridge. Copies are available from CAMESA free on request. Please make reference to CAMESA project 9000-12.

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Library—continued

Semiconductor Catalogue & Reference Data Manual

Catalogue 611S issued by Electro Sonic Supply Co. Ltd., Toronto contains 64 pages of specifications, dimensions, prices, and design information on a variety of transistors from many manufacturers. Items covered include transistors, voltage regulators, transistor transformers, tools, test equipment, solar devices, sockets, rectifiers, photoconductive cells, diodes and books on transistors. Copies may be obtained free of charge by circling number 152 on the reader service card in this issue.

Catalogues and brochures

Hammond Industrial Transformers and Cabinets, catalogue 68, describes the products manufactured by Hammond Mfg. Co. Ltd., Guelph, Ont. (153)

Microwave Antennas and Accessories, catalogue CM, provides specifications on antennas for the frequency range of 800 to 18,000 Mc. Andrew Antenna Corp. Ltd., Whitby, Ont. (154)

Relay catalogue C60 provides engineering data on 42 different series of relays from Potter and Brumfield, Guelph, Ont. (155)

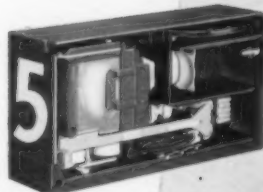
Radio Frequency Connectors is a 120-page catalogue containing illustrations and technical data on RF connectors manufactured by Kings Electronics Co., Inc., Tuckahoe, N.Y. (156)

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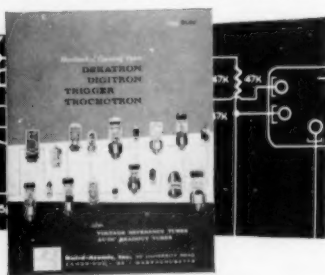
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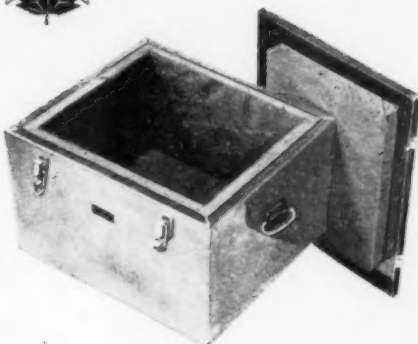
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The Pylon TC-4 offers unsurpassed protection for electronic equipment.

* Four feet is the mean distance your favorite shipper likes to drop electronic equipment, according to a recent government survey. Airlines average slightly more.



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Institute for Northern Studies to investigate VHF communications

A radio communication system in the very high frequency field is under investigation by the Institute for Northern Studies at the University of Saskatchewan.

Details are contained in the Institute's first annual report issued recently by Dr. J. B. Mawdsley, director.

The report says it is believed the system will operate even under conditions where electric storms are prevalent, as in Northern Saskatchewan. "Such a system would do away with long communication blackouts that are now serious matters when sickness or forest fires are involved."

The investigation was initiated on the suggestion of Prof. P. A. Forsyth of the physics department, and will be a co-operative venture of the Departments of Physics and Electrical Engineering and the radio branch of the Department of Natural Resources.

Toronto AIEE plans new technical groups

The Toronto Section of the American Institute of Electrical Engineers is forming two new technical groups which will conduct lectures during the 1961-62 season. The Computing Group has planned a series of 6 lectures on Digital Computers for engineers who have no previous knowledge of the subject. The Protection Group intends to have a series of about 8 lectures on the subject of Protective Practices as applied to Industry and Electric Utilities.

Toronto Section has also announced that two more of its members have been admitted to the grade of Fellow in AIEE. They are Prof. G. F. Tracy,

Head of the Department of Electrical Engineering, University of Toronto, and J. M. Hambley, General Manager of Ontario Hydro.

Warren H. Chase is president of AIEE

The American Institute of Electrical Engineers has elected Warren H. Chase as its president for 1961-62. Mr. Chase, who is vice-president of the Ohio Bell Telephone Co. has been a vice-president of AIEE since 1958.

J. Prescott Skillen, Hamilton, was elected vice-president, District 10 (Canada). New officers take up their duties on Aug. 1.

Teachers receive electronics training

The Canadian Electrical Manufacturers Association, is sponsoring a series of summer courses for vocational teachers to bring them up-to-date on recent technological advances. The series, started last year, offers three courses. In 1960 the subject was Electrical power distribution and equipment. This year's course is Telecommunications and electronics. Next year the course will be Industrial controls and servo systems.

A team from CEMA's education committee, the Ontario Vocational Education Association, the Electrical Section of the Ontario Education Association, and the staff of Ryerson Institute of Technology have worked together to establish a course curriculum and timetable. The group has also won recognition for credit purposes in the teacher certification plan of the Ontario Secondary School Teachers

Federation.

CEMA is aiming to have this summer course serve vocational teachers in all ten Provinces.

Teachers will spend two weeks at Ryerson Institute studying the theory of transistor circuits, electronic circuits, television circuits, and in consultation and review. Complementing theoretical studies will be two weeks in industrial plants around the Toronto area.

COMING EVENTS

July

16-21 4th Internat. Conf. on Medical Electronics & 14th Conf. on Elec. Tech. in Med. & Biology. Waldorf Astoria, New York.

August

1-4 National Conf. of Associated Police Communications Officers, Inc. Lafayette Hotel, Long Beach, Calif.

16-18 2nd Internat. Electronic Circuit Packaging Symp. Univ. of Colorado, Boulder, Colo.

21-31 Conference on New Sources of Energy. United Nations, Rome.

22-25 WESCON. Cow Palace, San Francisco, Calif.

23-Sept. 2 1961 British Radio Show, Earls Court, London.

September

1-8 1961 Firato. Internat. Exhibition of Electronics. R.A.I. Exhibition Centre, Amsterdam.

4-8 Conf. on plasma physics and controlled nuclear fusion. Salzburg, Austria.

4-15 Internat. conf. on cosmic rays and the Earth storm. Kyoto, Japan.

5-8 Assoc. of Computing Machinery 1961 Conf. Statler Hilton Hotel, Los Angeles.

6-8 1961 Joint Nuclear Instrum. Symp. North Carolina State College, Raleigh, N.C.



Lenkurt Electric Co. of Canada completed the second half of its third annual engineering seminar recently in Edmonton. The theme this year was light-route and mobile radio. Some of the speakers are shown above. They are (left-right) E. V. Collier, Canadian General Electric Co.; C. J. Bridgland, Canadian National Telegraphs; T. D. Cushing, Lenkurt Electric Co. of Canada; B. R. Tupper, B.C. Telephone Co.; G. A. Muir, Manitoba Telephone System. The same seminars are held each year in Montreal and Edmonton.

Button mica capacitors

The August issue of CEE will feature a report on hermetically sealed button style mica capacitors developed at Erie Resistor of Canada Ltd.

Other feature stories will describe the oblique ionospheric sounder developed by DRTE and Philips Electronics Industries, and the electronic equipment included in Canadian National Railways' new \$15 million Moncton Yard.

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1 mv end-scale sensitivity!

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413A Null Voltmeter

Specifications

VOLTMETER

Ranges: Positive and negative voltages, 1 mv to 1,000 v end scale, 13 zero-center ranges.

Accuracy: $\pm 2\%$ of end scale value

Input Impedance: 10 megohms on 1, 3 and 10 mv ranges
30 megohms on 30 mv range
100 megohms on 100 mv range
200 megohms on 300 mv range and above

AC Rejection: A voltage at power line or twice power line frequency 40 db greater than full scale affects reading less than 1%.
Peak voltage must not exceed 1,500 v.

AMPLIFIER

Voltage Gain: 0.001 to 1,000 in 13 steps

Gain Accuracy: $\pm 1\frac{1}{2}\%$

Gain Linearity: $\pm 0.2\%$

Noise: Less than 0.1% (rms) of end scale on any range

Output: 1 volt for end scale deflection, same polarity as input. End scale corresponds to 1.0 on upper scale. Max. load current, 1 ma.

AC Rejection: Approx. 3 db at 1 cps, 80 db at 50, 60 cps

Input Isolation: Greater than 100 megohms shunted by 0.1 μ f in instrument case (power line ground)

Common Signal Rejection: May be operated up to 500 v dc, or 130 v ac above ground

Dimensions: 11 $\frac{1}{2}$ " high, 7 $\frac{1}{2}$ " wide, 10" deep (cabinet); 5 $\frac{1}{4}$ " high, 19" wide, 7 $\frac{1}{2}$ " deep behind panel (rack mount)

Price: 413A, \$350.00 (cabinet); 413AR, \$355.00 (rack mount)

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